PLASTICS TECHNOLOGY

JULY 1961

THE MAGAZINE OF APPLIED ENGINEERING

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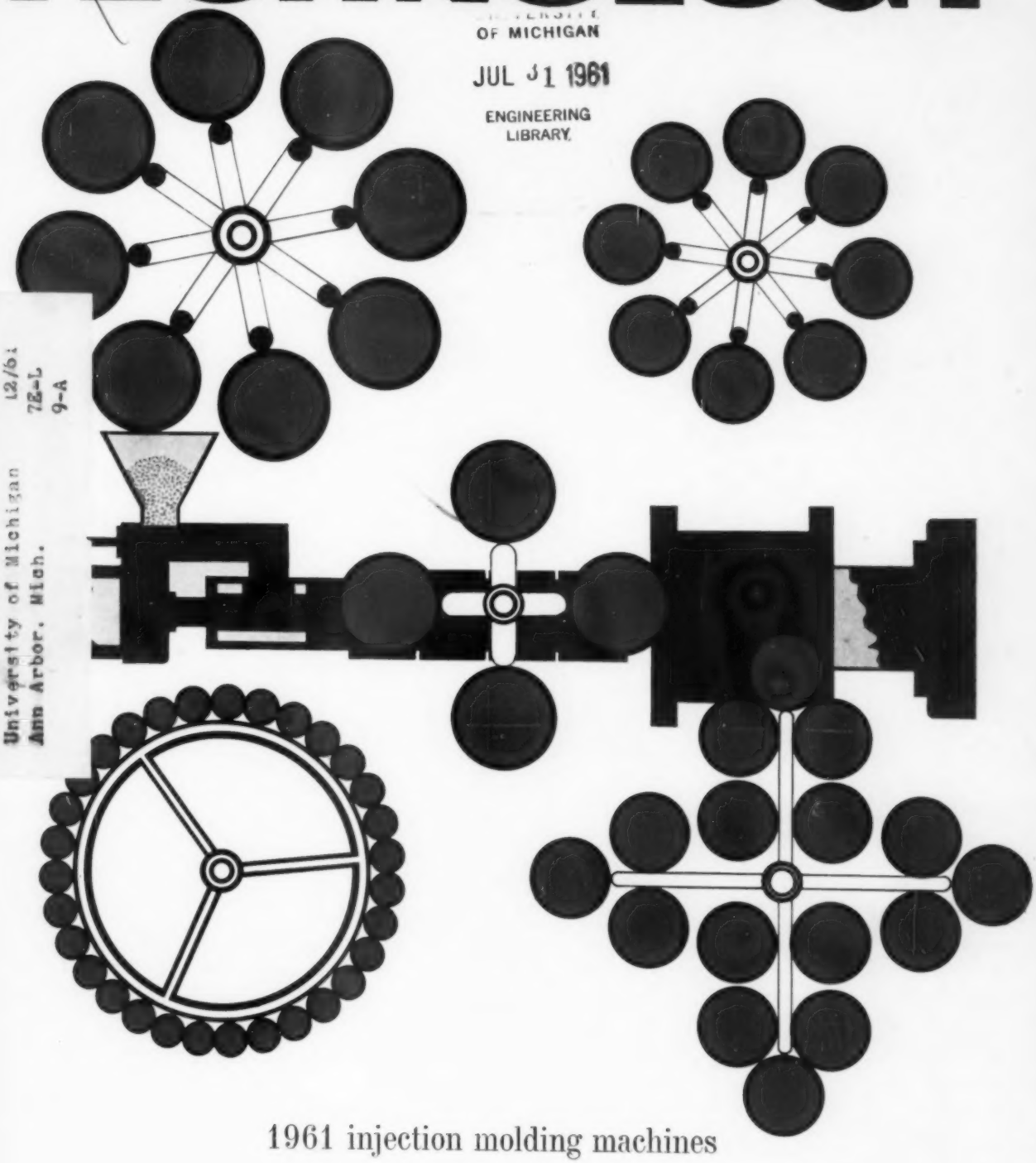

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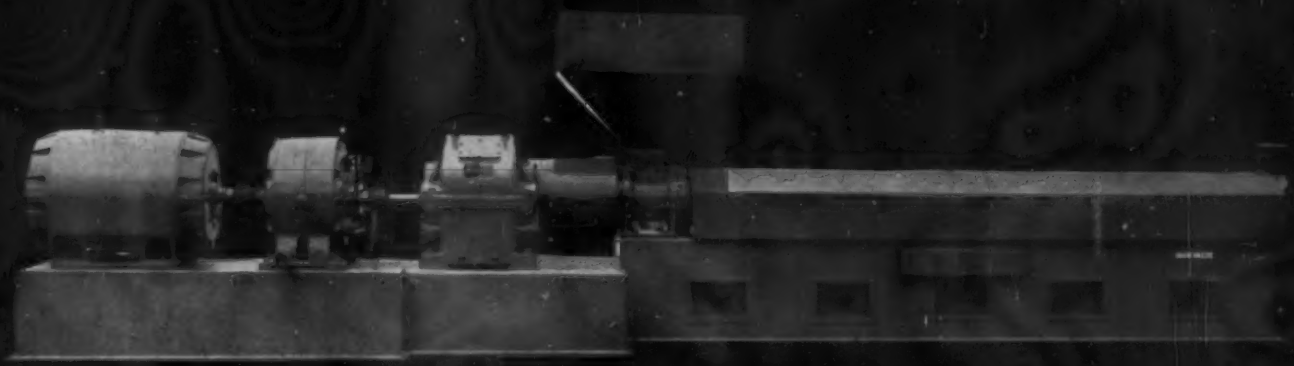

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PLASTICS
THE MAGAZINE OF APPLIED ENGINEERING
TECHNOLOGY

July 1961, Vol. 7, No. 7

feature articles:

Polypropylene monofilament extrusion ..... p. 23

by H. Mahn and J. Vermillion

Drafting increases polypropylene monofilament tenacity more than any other phase of production. It is a function of temperature up to the melting point of the material, and electrically-heated hot-air ovens were used before and after roll stretching. Draft ratios are computed by dividing the higher speed of the drafting rolls by the speed of the pull-out rolls.

Specialization—key to design of injection machinery ..... p. 26

by I. Rubin

Too few molders really understand all of the design features available on the newer injection molding machines. Since there are so many features which are optional at extra cost, one should re-evaluate his operations taking into consideration both current and future needs. Areas to consider and means of accomplishing same are given.

special features:

PT's comparative data on 1961 injection molding machines ..... p. 31

PT's classified list of auxiliary equipment for injection molding ..... p. 37

guest editorial:

What has happened to the shirtsleeve image ..... p. 42

by Chaylie Saxe

A molder feels that too many small businesses expect things to be handed them on a silver platter. Unless you concede to the "welfare state" premise, only hard work and initiative will give you the edge.

exploring fabrication techniques:

Casting powdered resins, Variable orifice gating ..... p. 47

by L. J. Zukor

Interest in rotational molding is revived through powdered resin casting. Part II points out that mechanisms which were first incorporated into the mold are now part of the machine itself.

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Letters to the Editors

Sirs:

Four representatives with our company, Loma Industries, Inc., recently returned from New York City where we attended the 9th National Plastics Exposition at the Coliseum.

At the last show in Chicago our people protested vehemently to the fact that it was impossible for them to get close to or talk with any of the exhibitors or view any of the exhibits. This was because. . . . idle curiosity seekers collecting samples either blocked our vision or prevented any opportunity we may have had to discuss our problems with exhibitors.

Having had assurance from several sources after the Chicago show that this would not recur, we all anticipated that the New York show would be a different show and, consequently, descended upon it en masse, prepared to review the various exhibits, analyze them, and place whatever orders we felt necessary then and there.

Lo and behold, even with the $2 charge, curiosity seekers had swamped the show to such an extent that again four days' of our people's time, plus the considerable expense of conveying them from Texas to New York was, for the most part, wasted.

We prefer not to attend another National Plastics Exposition if it is run in the current manner. We would rather send our engineers and purchasing agents directly to the supplier's factory to make contact and, see the various products they intend to review and purchase. This may entail a longer time and a larger expenditure of money, but we feel that at least we will have something to show for our efforts.

We regularly attend and show at the National Housewares Manufacturers' Conventions and at the Hardware Conventions, as well as at the Industrial and Baby Shows. The National Housewares Manufacturers' Convention particularly might be held up as a prime example of how a good show should be run. There is no admission charge; however, the screening is such that only 8-10,000 people attend this show, but they are all buyers. Furthermore, no gimmicks, no giveaways, no samples, no raffles, are allowed by the show management. As a result, the insipid competition of giveaways, which drags in the curiosity seeker to collect samples he doesn't need, doesn't want, and doesn't use anyway, is eliminated. The gimmicks' only result is to keep away potential, interested customers from the exhibits.

I wonder how many plastics people felt the same way we did about this last show? If enough of them come forth, perhaps we can aid and abet the straightening out of what could be a most magnificent effort.

Louis H. Barnett, President
Loma Industries, Inc.
Fort Worth, Texas

Sirs:

It is with great interest that we read in your article of May 1961 [Exploring Fabrication Techniques] of an experimental process for producing expanded PVC coated fabrics with Nitrosan (70% N,N′-dinitroso-N,N′-dimethylterephthalamide-NTA) as the foaming agent. It is rather surprising, however, that in connection with this process, you have failed to mention azobisformamide (ABFA), manufactured in this country by, among others, National Polychemicals, Inc., under the designation Kempore R-125.

It is estimated that 12½ million yards of expanded PVC coated fabrics were produced in 1960; this output will be doubled this year. Virtually all of the PVC foam laminates currently on the market have been made with azobisformamide. There are several valid reasons why azobisformamide has dominated the PVC foam field. This relatively fast yet gentle decomposition of ABFA permits the production of PVC foam with extremely fine and uniform cell structure. ABFA and its residue are known to be non-toxic and non-irritating. PVC foam made with ABFA is odorless and non-staining. The storage stability of ABFA and that of PVC compounds containing it is unexcelled. Unlike nitrosoamines, ABFA does not support combustion and is self-extinguishing. The gas yield of ABFA is the highest of all commercially available organic foaming agents. Not only the blowing agent itself is economical in use, but also basic PVC compounds that can be expanded with ABFA are less expensive than those adaptable for foaming with NTA. In PVC compounds containing the common heat and light stabilizers of lead, cadmium, and/or zinc type, the decomposition temperature of ABFA closely coincides with the fusion temperature of the plastisol. On the other hand, no premature decomposition of ABFA occurs when the foamable plastisol is gelled prior to application of fabric.

Henry R. Lasman, Org. Chem. Mgr.
National Polychemicals, Inc.
Wilmington, Mass.

Articles on schedule

A Ciba article on the reaction mechanisms, chemical structures, and changes in properties during the cure of epoxy resins will appear in the August issue. Drs. Fisch and Hofmann offer new analytical methods which show certain correlations between the chemical composition of a cured epoxy resin and its physical properties. Control of exotherm results in low shrinkages.

•

Another article by Irvin Rubin of Robinson Plastics tells what's wrong with machine instruction manuals. Maintenance personnel, in particular, depend on these manuals and it is for them that the manuals should be written. The material and diagrams which should appear, but don't, are covered.

•

J. R. Lynch of Dow Chemical Co. has prepared a comprehensive article on Thermoforming, which describes both the process and its applications. Diagrams and illustrations seem particularly good.

•

Kaufman Rubber's Gilbert Darcy has prepared an article on PVC footwear, describing the various manufacturing methods: dip molding, slush molding, low pressure injection, plus problems in making plastic overlay models and electroforming molds.

•

Union Carbide Plastics Co. offers us an article on prototype and mold fabrications, including an evaluation of the materials used. Mold stability and thermalconductivity are given.

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NEW FROM
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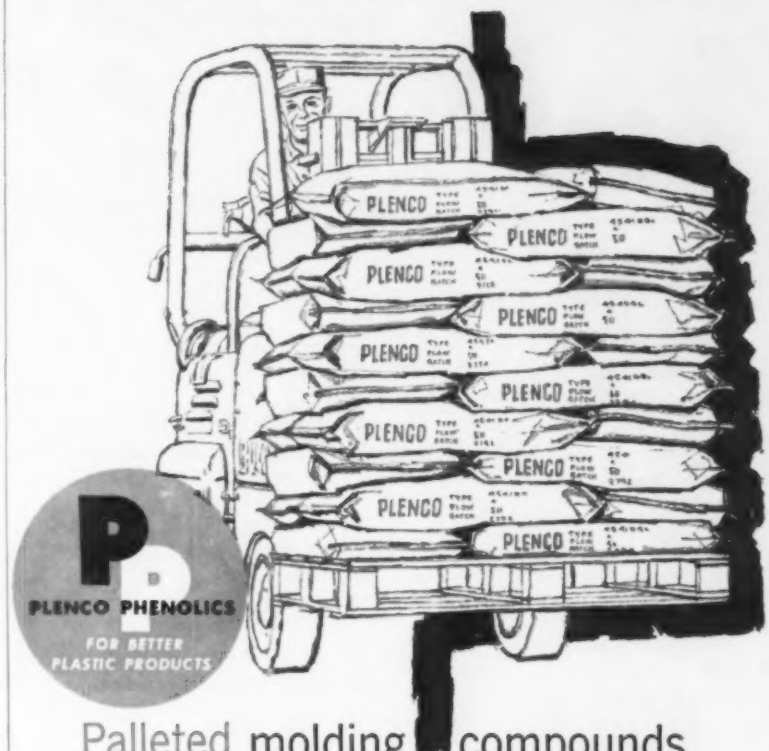

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We don't expect a pat on the back for an idea as simple as this; but it does show that we are thinking in terms of your convenience when using PLENCO products.

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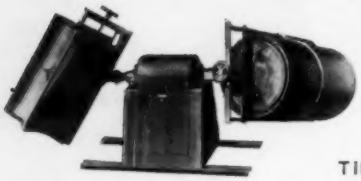

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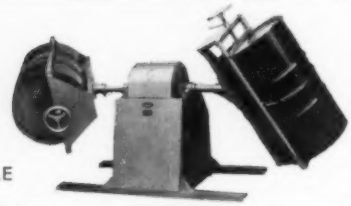

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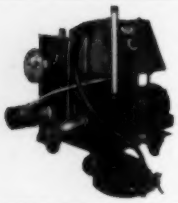

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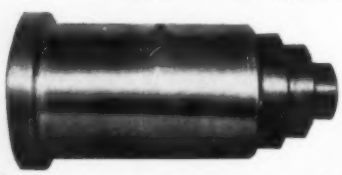

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GRACE PLASTICS

What's new in processing

A new technique for producing vinyl coated fabrics has been developed by Haartz Auto Fabrics Co., Boston, Mass. Based on a process development of Union Carbide Plastics Co., the technique is extrusion coating with vinyl chloride. Because extrusion coated plastisols are pre-fused, no subsequent heating steps are required, and strike-through problems are nonexistent.

In comparison with knife and roller coating methods, extrusion coating is said to allow use of higher molecular weight resins, produce little or no shrinkage, impose no heat history on the cloth, and provide only moderate fabric penetration.

By spraying an undercoating on materials to be vacuum metallized, processors can increase the durability of heat-reflective gold and aluminum coatings. The organic undercoating, developed by Swedlow, Inc., is a modified silicone. When sprayed on a material or part, it not only provides a smooth, adherent surface for the coating, but acts as a barrier to prevent diffusion of the coating metal into the base. It can be used on ferrous and non-ferrous metals, as well as reinforced plastics.

Abstracts

"Surfacing Sheet Metal with Rigid PVC Sheet" by C. Kubitsky, Plastverarbeiter, December 1960, discusses a method of bonding rigid PVC to steel or aluminum which permits subsequent forming of large parts without damage to the plastic. PVC polymers and copolymers, adhesives, and treatment of the metal surface are included.

"Varnishing Plastics" by W. Wachendorff, Plastverarbeiter, December 1960, outlines methods for improving surface characteristics of plastics for special applications.

"Plasticizing PVC" by A. Passedouet, Pensez Plastiques, November and December 1960, sets up criteria for plasticizer behavior and shows how the five main types—phthalates, low temperature plasticizers, phosphates, polymeric plasticizers, and secondary plasticizers—fulfill the requirements. Consumption of individual products in Europe is compared with consumption in America.

"Operational Behavior of Single Screw Extruders in Processing Polyolefins and PVC" by H. O. Schiedrum and H. Domininghaus, Plastverarbeiter, November and December 1960 and January 1961, briefly considers the theory of screw characteristics in relation to performance. Some measurements are discussed in detail and compared with calculated values. 53 figures.

"Blow Moulding of PVC Compounds" by G. H. Burke, British Plastics, March 1961, explains how PVC can be blow molded and indicates the type of equipment most suitable.

"Rigid Container Forming" by George P. Kovach, Plastics World, April 1961, details recent developments in injection molding, blow molding, and sheet forming of rigid plastic containers.

"Colouring and the Dry Colouring Process for Polyethylene" by T. G. MacKriel, Rubber and Plastics Age, March 1961, discusses the properties of colorants with particular emphasis on inorganic pigments and their use in dry coloring. Breaker plate designs are suggested as a method of improving color dispersion of dry colored polyethylene.

Patents

2,972,170 to Birckhead Corp. A method of molding methyl methacrylate monomer.

2,971,222 to Celanese Corp. of America. A process for extruding a flat, thin gage, uniform film of high density polyethylene.

2,970,078 to Plax Corp. Polyethylene can be bonded to itself or other surface with an aqueous solution of chromium trioxide.

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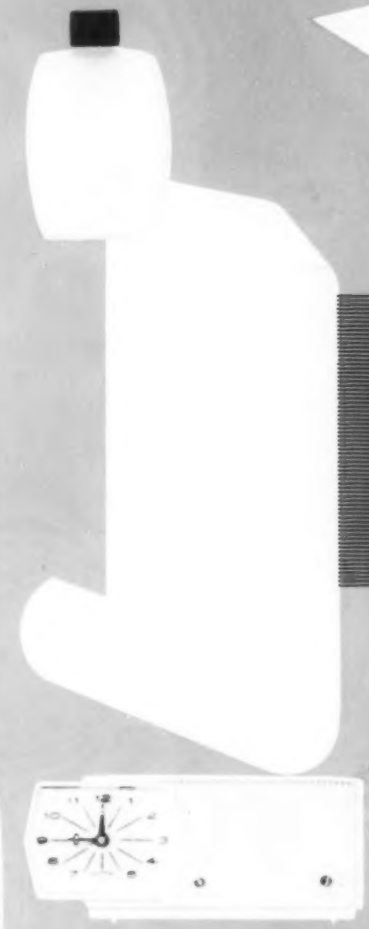

Salesmen, sales managers and other marketing people know the big difference the *exact shade* of white can make. On the retail counter, gloss, flat or striking "blue" whites have different appeals . . . can make or break consumer reactions.

So marketing, as well as production and technical men, are learning the values of Glidden *Zopaque* Titanium Dioxide. *Zopaque* can be counted on to give *certain* optical qualities for high opacity, hiding strength and tinting power.

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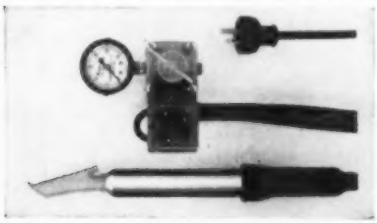
A series of advertisements for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins

JULY, 1961 — U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corporation — 99 Park Ave., N. Y. 16, N. Y.

Packaging Notes

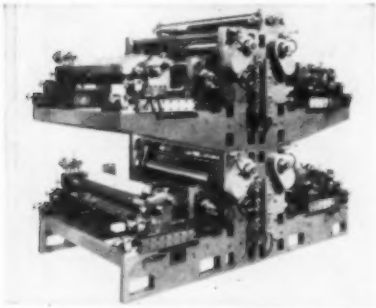
Paste spackling for patching cracks and nicks in plaster, wood and wallboard is now convenience-packaged in a ½-pint polyethylene tube. The manufacturer points out that easy, one-hand operation of the tube allows the user to keep the other hand free for spatula or putty knife.

Versatile hand-welder for polyethylene can be used for tacking or high-speed



welding at a production rate of 60 in. per min. Patented design maintains constant flow of high-temperature air through specially designed tips. Unit has a 3-heat metal element with an output of up to 800 watts and a 16-foot air-hose (with electric cable inside). Can be plugged into any 115 volt a-c outlet.

Expandable flexographic press permits the converter to add color units on a "building block" principle—lowering ini-



tial investment, yet allowing for future expansion. Side frames of additional units are merely bolted onto special prebored fittings within the existing frame.

This press is designed for use in in-line extruding and bag making, as well as roll-to-roll printing. It can print up to six colors, comes in sizes to accommodate web widths of 24 to 42 inches.

Polyethylene-coated cartons are now being used for chilled orange juice as well as milk. Leaking and flaking—shortcomings of wax-coated containers—have reportedly been virtually eliminated.

Polyethylene Film Extrusion Operators' Guide Issued By U.S.I.

New 56-Page Manual First of Kind to Be Offered by a Raw Materials Producer

"Polyethylene Film Extrusion . . . An Operating Manual" has just been published by U.S.I. The new 56-page booklet is the most complete and useful guide to efficient polyethylene film extrusion ever published. The first comprehensive manual prepared by a resin producer expressly for film extruder operators, it represents a major effort by U.S.I. to improve and standardize polyethylene film.

The booklet provides the extruder operator with everything he needs to know to make the best possible polyethylene film at the most efficient production rates. It distills the experience not only of U.S.I. sales and technical service departments, but also of many extruders themselves. It presents this information in easy-to-understand terms familiar to everyone — those who operate and maintain extrusion equipment, as well as their supervisors.

Pages 14 & 15 of U.S.I.'s new information-packed 56-page booklet which is available through U.S.I. salesmen.

First the Basics...

For workers new in the field, this manual provides such fundamental information as what polyethylene is, how it's made and how modifications of its basic molecular characteristics affect resin and end product properties.

A section on what happens to the polyethylene resin on its way through the film extruder follows. Included are simple diagrams of the extrusion machine and explanations of the functions each part performs.

Next come tips on how to open a polyethylene resin bag properly to save time and minimize contamination problems.

Then the Particulars

The core of U.S.I.'s new manual helps define the problems operators and maintenance men have to cope with and offers some practical solutions. Specifically there are chapters on: melting the resin; film cooling and frost line; the blown film bubble; take-off and windup equipment; checking and keeping a record of extruder controls; cleaning the extruder; means of increasing output and improving quality. The last contains a full-page table listing the most common defects in extruded film and their possible causes.

50 Do's and Don'ts

The booklet winds up with some basic safety rules and a checklist of some 50 Do's and Don'ts, which is also available as an 11" x 15" wall chart for posting near the extruder.

Copies of the operating manual and poster can be obtained through your U.S.I. salesman. Sales office branches are found in most large cities. Ask your U.S.I. salesman for your copy and extra copies for your plant operators.

Best in Show

This toy dog wins a blue ribbon for demonstrating a new and unique use of polyethylene film. It's cleverly fashioned by a Texas woman whose deft hands also transform polyethylene film into toy rabbits, Christmas wreaths.

The poodle comes in black, white or pastel colors. Model shown sells for approximately seven dollars.

New Blending Resin Introduced by U.S.I.

Development of a new injection molding blending resin, PETROTHENE 250 Polyethylene (density 0.926, melt index 250), has just been announced by U.S.I. Very high flow and ease of blending are its key properties.

It can be blended with lower melt index resins to improve their flow for injection molding or used alone for non-critical injection molding applications.

In trial runs at U.S.I.'s Polymer Service laboratories, items molded from blends of PETROTHENE 250 and lower melt index resins had physical properties superior to those molded from blends utilizing polyethylene waxes. Also, items molded from the straight resin exhibited very high gloss and good surface smoothness, as well as good stiffness and high impact resistance at room temperature.

U.S.I.

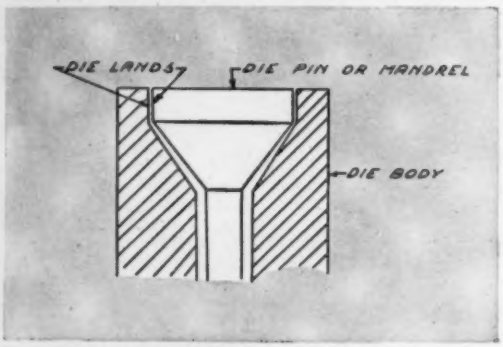
Series VI, No. 4

POLYETHYLENE PROCESSING TIPS

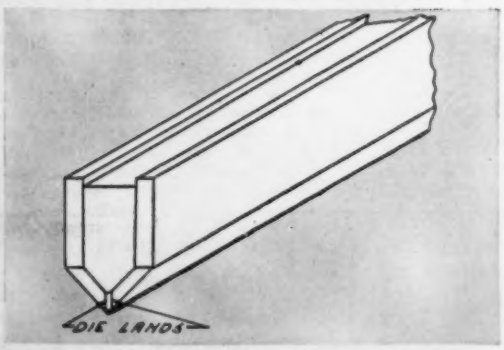
CARE AND CLEANING OF EXTRUDER DIE LANDS

In polyethylene film extrusion and extrusion coating, the die lands (see diagrams) must be kept clean and free from nicks and scratches. These are the final surfaces over which the hot melt passes before leaving the die, and which shape the hot plastic and help to produce smooth surfaces. Any surface irregularities in the lands show up as lines or streaks in the plastic. If severe, they weaken the film, but in any case, they are undesirable since they spoil film appearance.

Oxidized particles are a major cause of rough die lands. If proper care is not taken, small raised areas of oxidized plastic can form on the lands, marking the film as it passes by in the hot melt stage.



Location of die lands on blown film die.



Location of die lands on flat film and extrusion coating die.

Preventing Oxidized Polymer Build-Up

Oxidation is more of a problem in flat film extrusion (chill roll or water quenched) and extrusion coating than in blown film extrusion. That's because these require much higher temperatures, which promote oxidation. Care in shutting down the flat film extruder or extrusion coater will reduce the problem of oxidized polymer on the die lands. Simply shut off the temperature controls and let the hot melt temperature fall below 400°F before shutting off the screw.

Several other precautions will cut polymer build-up on the lands in all types of equipment. A simple method is to remove oxidized polymer daily, or more often, use a brass blade which is thinner than the die opening. The blade should be dull and have a rounded tip so it won't mark the hot lands. Insert it between the lands and push it along their length (or around their circumference, in the case of blown film). The blade should always be pushed around or across the entire surface of the lands—never in and out at one spot.

A second step in keeping die lands clean and smooth is to schedule a complete cleaning on a regular basis. How often is best determined through experience. In most cases, cleaning at least once a week is necessary.

Cleaning Procedures

In blown film extrusion, the die lands are a part of the die body and mandrel. Hence, in cleaning the lands, the entire internal die surface is cleaned as well. Following is the recommended procedure:

1. Remove die from extruder while it is hot.
2. Pull mandrel or die pin from die body.
3. Scrape excess polymer from die pin and die body with a soft metal (brass or copper) or wood instrument.
4. Remove the last bits of polymer with brass or copper wool.
5. Polish mandrel and internal surface of die body, using a very fine grit cleaner (2400 grit lapping compound is used at U.S.I.'s Polymer Service Laboratories) on a soft, damp cloth or tissue.
6. Give lands a light coat of silicone grease.

A similar procedure is followed for the lands of flat film and extrusion dies. First remove the die jaw while hot – but below 400°F. Next remove the die lands from the jaws if they are separate. Then clean the jaws and lands as in steps 3 and 4 above, and polish and coat the lands as in steps 5 and 6.

A Word of Caution

In cleaning and polishing die lands, ***never*** let a screw driver or other hard metal tools touch the lands; they cause nicks and scratches. ***Always*** clean and polish with smooth, even strokes in a direction perpendicular to resin flow; this eliminates the danger of rounding the die lips.

Cleaning procedures outlined above will substantially reduce the amount of off-quality film resulting from contaminated die lands. However, from time to time, the lands will have to be refinished either by honing or, if they are chrome plated, by replating. U.S.I. Technical Service Engineers can give you advice on these procedures.

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MELT STABILITY AND FLOW SENSITIVITY OF MOLDING MATERIALS

Advanced molding techniques often require a knowledge of a plastic molding material's stability at higher-than-normal operating temperatures. Since it is essential to operate under conditions which will not degrade the material, both melt stability and flow sensitivity at various fabrication temperatures are of prime importance.

The sensitivity of melt flow to temperature changes is of particular interest when determining optimum molding cycles for new materials. With the proper data, it is usually possible to select a temperature for the new material which will give flow behavior comparable to that of a known material. This provides a useful starting point for characterizing new polymers.

The temperature-viscosity relationship also indicates the degree to which stock temperature must be controlled during fabrication. A sensitive material, for example, will exhibit widely varying flow with small changes in machine temperature. Where the proper data are available, and properly interpreted, it is possible to change quickly from one material to another with a minimum of lost machine time and rejected parts.

By means of a capillary type plastic viscometer, Dow thermoplastics have been evaluated under varying conditions. This apparatus makes it possible to hold materials at known stock temperatures for extended periods of time. Melt viscosity is measured by forcing the plastic through a capillary at a shear stress comparable to that expected during fabrication.

A study of viscosity as a function of time at a constant temperature and shear stress indicates the thermal stability of the plastic melt. Melt viscosity at varying temperatures indicates the viscosity-temperature sensitivity of the material.

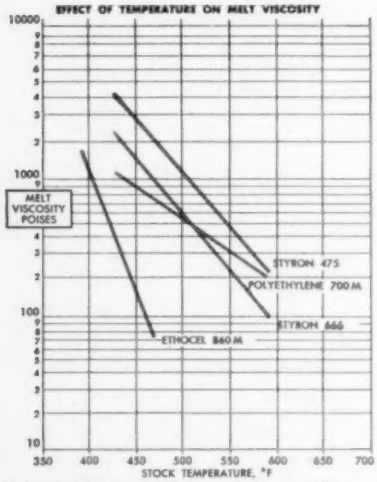
The data in Graph I indicate the sensitivity of the melt viscosity of ethylcellulose to temperature change. Polystyrene and its copolymers are intermediate, while polyethylenes are the least sensitive of the three.

Graph II shows melt stability of Styron 440 at various temperatures. Initial degradation at 550°F. is indicated by a slight drop in viscosity during the one-hour test period. At 600°F., a serious drop in viscosity is found. It would not be advisable to hold stock temperatures of this material at this level for any appreciable time. (In practice, stock and machine temperatures may differ widely. In injection molding, for example, the cylinder temperature may exceed the stock temperature by 100 to 150°F. where short cycle times are used.)

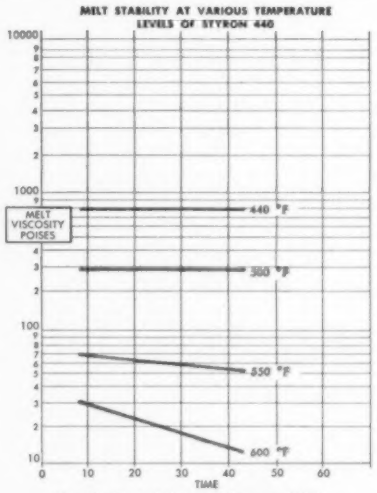
Degradation temperature levels for some typical materials are given below. Slight degradation is noted at the lower temperatures, and becomes more pronounced as temperatures increase.

AMERICA'S FIRST FAMILY OF THERMOPLASTICS

Styron®	•	Polyethylene
Zerlon®	•	PVC Resins
Ethocel®	•	Pelaspan®
Tyril®	•	Saran



I. Viscosity-temperature sensitivity of four Dow thermoplastics.



II. Melt stability of Styron 440.

TABLE 1

Degradation temperatures

Material	Range, °F.
Polyethylene, all densities	600-650
Styron	550-600
Tyril	550-600
Zerlon	500-525
Ethocel	425-450

Because of the continuing studies by Dow Plastics Technical Service engineers, considerable data on melt stability and flow sensitivity of thermoplastics are available. Designers and plastics engineers are invited to contact Dow for more detailed information. Write Molding Materials, Plastics Sales Department 1734DT7.

THE DOW CHEMICAL COMPANY DOW Midland, Michigan

JULY, 1961

Editorial: Plastics show brings down house

It seems particularly appropriate that our first issue after the Plastics Exposition be a special on Injection Molding. At each show, there's one feature which attracts special interest—often of a controversial nature. In this case, it was movable-screw injection molding.

We at PT hope we'll never be accused of ducking an issue. By the same token, we want to present all sides of a question, giving the pros and cons as we see them. In May, we carried an article which pointed up the advantages of screw injection. In August, we have scheduled an article which voices certain objections and/or limitations which may restrict its use (in its present design) in the United States. One thing is certain, however; it's a hot subject which should concern everyone interested in thermoplastics molding.

A star is born?

Nearly every injection machine manufacturer had a screw unit on display, but there were some questions in the audience's minds. Were they (the American units) ready for Broadway, or did they need more time on the road to work out the bugs? Does success in Europe guarantee success here?

It has already been pointed out that European methods and requirements are different from ours. But are they basically different? One factor which may limit European production speeds is the mold rather than the machine. I have yet to hear any claims of European mold technology equaling, let alone surpassing that of the United States. You cannot get fast cycles with an inadequately chilled injection mold.

I'm sure, however, of one thing. Those who considered screw plasticizing "a novel idea, but impractical" are the same who won't look over an article or attend a meeting unless it concerns their specialty. Screw action and the adiabatic principle have been described many times in many ways. I can't understand why a molder wouldn't be at least interested, if not fully aware of other, sometimes competing techniques.

That's show biz

One of our letters to the editor this month (from Lou Barnett of Loma Industries) gives a very critical review of the show. I think his points are valid, but disagree with his conclusions. He would have his representatives stay away from the show if machines were molding sample items.

It certainly was difficult to discuss materials and equipment at certain booths which were turning out give-away items. Many equipment manufacturers, however, did not have their machines running or ran them intermittently. This, I think, is the answer rather than ruling it out altogether.

One last point—a good salesman can "smell" a customer, and not all those lined up for samples were "idle curiosity seekers." Even if they were, a $2.00 cover wouldn't keep them out. That's show biz!

Jim Dugan

Editor

Why the MOLDER

talks D-M-E SERVICE to the Mold Designer and Mold Maker

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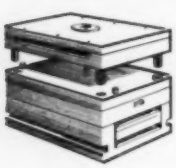

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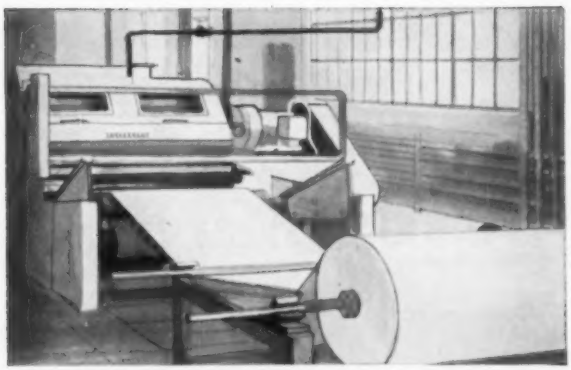

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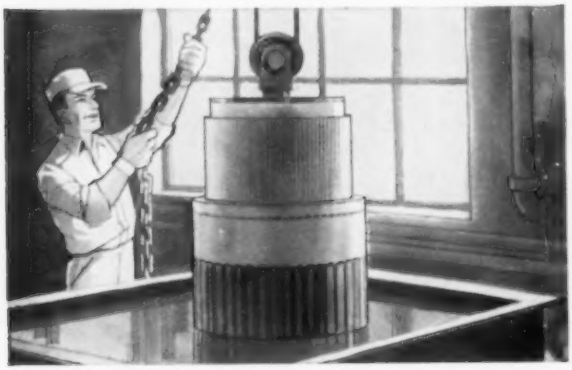

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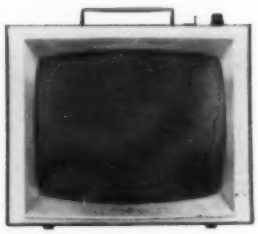

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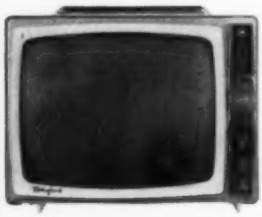

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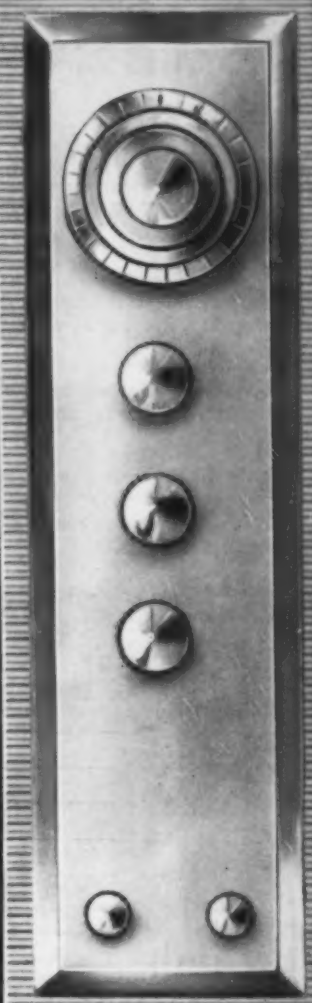

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New from Emery Research

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Emery research has achieved a significant breakthrough in the field of polymeric plasticizers. Four new polymerics have been introduced to complement Plastolein 9720, the industry's largest selling polymeric. Together, they now give you a single source for a wide range of your plasticizer needs. Although Plastolein 9720 will continue to be the choice in uses demanding its ease of processing and low viscosity, the four new plasticizers meet other needs:

Plastolein 9722: An improved version of Plastolein 9720 in humidity and outdoor aging, compatability, extraction and migration—at the same low cost. (Formerly Emery 3282-D)

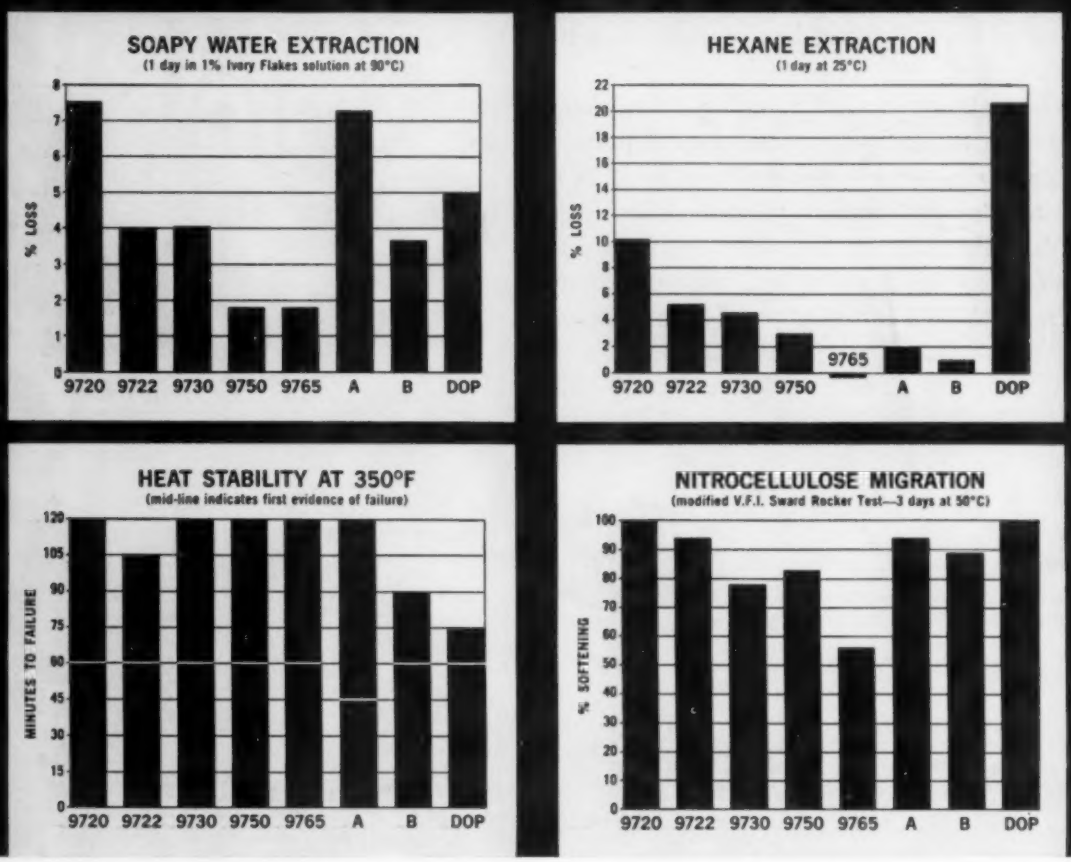
Plastolein 9730: Now, the lowest cost polymeric plasticizer featuring low migration properties, excellent outdoor stability, and good soapy water resistance. (Formerly Emery 3311-D)

Plastolein 9750: A good, general-purpose, medium molecular weight polymeric at low cost, with excellent soapy water extraction and outdoor stability. (Formerly Emery 3313-D)

Plastolein 9765: The medium molecular weight polymeric plasticizer offering the best all-around permanence. Its cost is low, humidity aging outstanding, and extraction resistance tops. Special deodorized grade available. (Formerly Emery 3314-D)

Extensive aging tests have been conducted by the South Florida Test Service. The Emery polymerics were compared with two leading competitive plasticizers and with DOP. Results show outstanding superiority of the Plastolein polymerics. Full information on the new Plastolein Polymeric Plasticizers including reproductions of test samples is available in Technical Bulletin 424. Write Dept. Q-7.

Check Plastolein Polymeric performance on eight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(1 day in 1% Ivory Flakes solution at 90°C)
% LOSS
0 1 2 3 4 5 6 7 8
9720 9722 9730 9750 9765 A B DOP
HEXANE EXTRACTION
(1 day at 25°C)
% LOSS
0 2 4 6 8 10 12 14 16 18 20 22
9765
9720 9722 9730 9750 A B DOP
HEAT STABILITY AT 350°F
(mid-line indicates first evidence of failure)
MINUTES TO FAILURE
0 15 30 45 60 75 90 105 120
9720 9722 9730 9750 9765 A B DOP
NITROCELLULOSE MIGRATION
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Vinyl-metal laminates	●	●	●	●	●
Industrial tapes		●	●	●	●
Shoe constructions	●	●	●	●	●
Surgical tapes				●	●
Plastisols, organosols	●	●	●	●	●
Coated paper	●	●	●	●	●
Pigment grinding	●	●		●	●
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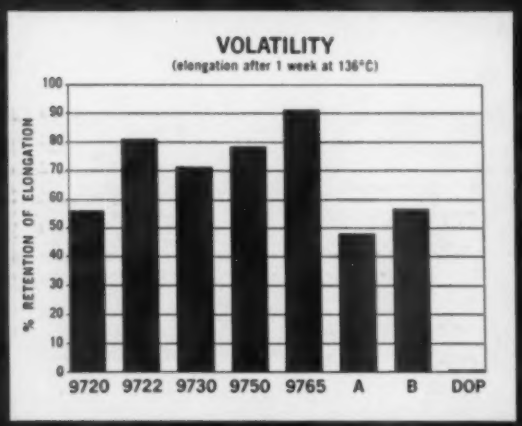

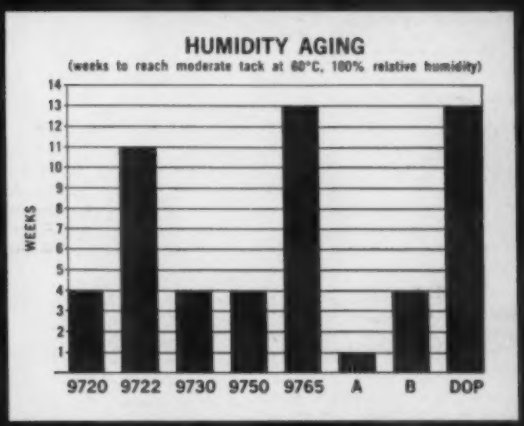

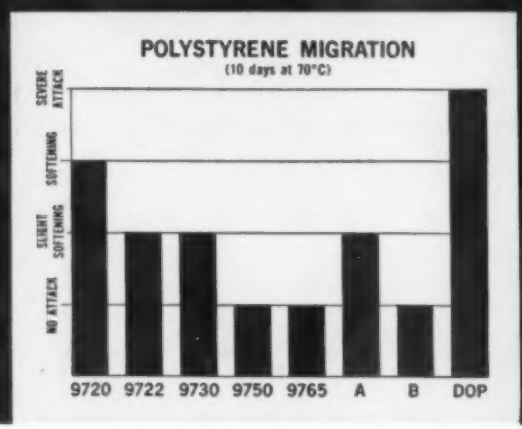

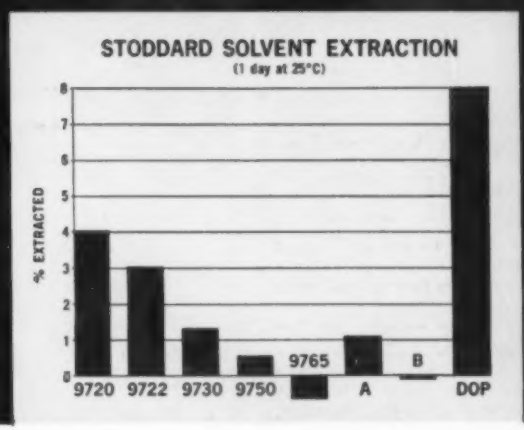

PHILLIPS 66 MARLEX® PLASTICS

BRIEFS

REPORT 61-2

Looking for new markets? Try us!

Although new items made from MARLEX are coming along fast and furiously these days, the market is hardly scratched. A big factor in this happy state of affairs is the ever-increasing number of potential uses for our resins because of constantly improving fabrication techniques and the development of more resin types.

Examples of MARLEX Marketing Information Reports available at our sales offices. To date, some 24 reports have been published.

Overabundance of potential applications has its problems, of course, for those fellows wishing to bring out new MARLEX items. What are the items with a ready market? What are the annual needs for these items . . . distribution . . . long range outlook . . . and so forth? Choosing new items is not easy when tooling and development dollars are involved. Perhaps our Market Research and Commercial Development Group can help when it comes to making these soul-searching decisions. They collect, tabulate, evaluate, and report on potential applications for MARLEX high density polyethylenes, ethylene copolymers, and tailored resins. As it is assembled, this marketing data is put in published reports that are available to all interested. They may be obtained at our district sales offices. If you're in the mood for new ventures . . . why not give us a try!

Thermoforming Shapes Up ...Yes, New Data

In the plastic industry, sheet-forming technology always seems to fall behind the availability of newly developed sheet. MARLEX High Density Polyethylene sheet is no exception. This is tough, durable plastic and forming it properly requires some extra "know-how." Yet, to those who have mastered the art, the outlook is exciting. Already such items are in the works as a 12-foot boat, decorative wall paneling, large re-usable shipping containers, lawn mower parts, and tote trays and boxes of all sizes and shapes.

We're doing our best to broadcast what we have learned from our research on thermoforming. In this vein, we have recently published some technical data on mold design. Discussed are such questions as mold material, cooling channels, contouring, surface finish, shrinkage, and male versus female molds. It's all contained in our Technical Information Bulletin No. 25, "Designing Thermoforming Molds for High Density Polyethylene." We also have a limited number of "MARLEX Sheet Weight and Cost Calculators," a useful slide-rule device for thermoformers. Write now!

Quality Control for Injection Molding

Assuming you're using resins of dependable uniformity and quality (such as MARLEX), there are a number of molding factors affecting the over-all quality and toughness of finished, high density polyethylene pieces. Most important are mold temperature, amount of mold packing, degree and uniformity of stock temperature, and injection speed. What are the effects of these factors? How can they be measured? What optimum values or conditions can be used to control quality during production?

We have just finished a rather exhaustive study on these questions . . . using a fair amount of technical paraphernalia. Interestingly enough, it all boiled down to some very simple and practical quality control measures. No expensive equipment is required . . . and superior molded pieces (often accompanied by appreciable resin savings) are the end results.

For example, both high production rates and maximum toughness are achieved with a low mold temperature. Mold temperatures above 100°F can result in poor quality items. Maintaining the minimum part weight consistent with good appearance is also important to both quality and economy. It is possible, through inadequate control, to pack as much as 17% excessive resin into a part. Brittleness and high part costs are the obvious results.

For those interested in a complete rundown on practical quality control while injection molding high density polyethylene and ethylene copolymers, we've put it all down in Technical Information Bulletin No. 27 . . . just off the presses.

The full scale thermoforming machine at our lab used in studying the problems of mold design. In the foreground, some of the items formed during this research program.

*MARLEX is a trademark for Phillips family of olefin polymers.

PHILLIPS CHEMICAL COMPANY, *Bartlesville, Oklahoma*
A subsidiary of Phillips Petroleum Company

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Jay L. Vermillion

Harry M. Mahn

Polypropylene monofilament extrusion

Disregarding the textile applications of polypropylene, monofilaments offer distinct price advantages in many areas which should account for real volume sales. Applications run from marine hawsers to window screening, auto seat covers, and outdoor furniture. For an earlier reference to techniques for extruding polypropylene monofilament, see our June, 1960 issue, pages 54 and 55.—Editor

HARRY M. MAHN* and JAY L. VERMILLION*

Drafting does more to increase the tenacity of polypropylene monofilaments than any other phase of production. The amount of drafting possible is a function of temperature, and the best temperature for strong monofilament is that which allows the greatest amount of drafting. These are the conclusions drawn by Eastman engineers from a recent study of monofilament extrusion with Tenite** polypropylene.

Monofilament tenacity also depends on the type polypropylene used, and high molecular weight formulations produce the strongest filaments. Our tests were run with a high molecular weight Tenite formulation which exhibits a low flow rate and, consequently, extrudes less readily than do formulations with higher flow rates.

Drafting polypropylene monofilament

Tests run on commercial equipment (See Fig. 1) show that the greatest draft produces the strongest monofilament. In the tests, monofilaments were drafted in an electrically heated, hot-air oven at several oven temperatures. At each temperature, they were stretched between rolls (located before and after the drafting oven) until they broke. Since both sets of rolls have the same diameter, the draft ratio was readily computed by dividing the higher speed of the drafting rolls by the speed of the pull-out rolls.

* Tech. Eds., Eastman Chemical Products, Inc.
** Registered trademark of Eastman Kodak Co.

The highest draft ratio which could be maintained without breaking the filament increases with the oven temperature up to the point at which polypropylene begins to melt. Beyond this point, the filament weakens and the amount of drafting possible begins to drop. The polypropylene formulation tested here is plotted in Fig. 2. Its highest draft ratio is 11.8:1 at 350° F. Although the tenacities (See Fig. 2) do not peak sharply, elongation clearly begins to turn up at the point of highest draft. This indicates that as the point of maximum draft is exceeded, the molecules are less effectively oriented. For the particular formulation, the strongest filament is produced at 350° F., the temperature which permits the greatest drafting.

Elongation may also be desirable in monofilaments which are to be used in fabrics. Here, a slightly lower draft ratio or some other modification of processing conditions might be considered. Generally, however, tenacity is more important than any other property.

In a separate series of tests, molofilament was drafted to various degrees at a fixed draft temperature of 300° F. The plot of tenacity versus draft ratio in Fig. 3 shows that filament strength increases with the degree of drafting up to a ratio of about 11:1. The higher ratios were achieved only by exercising great care, and would be impractical for continuous production. Thus, we see that the highest draft practical at any draft temperatures produces the highest tenacity.

Monofilament shrinkage decreases proportionately with the temperature at which it is drafted. Fig 2 shows

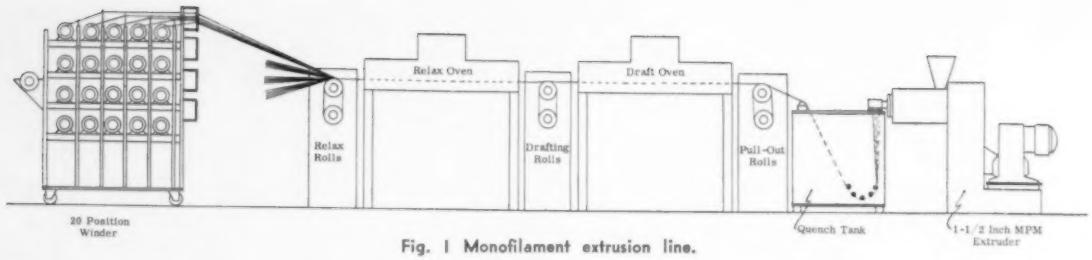

Fig. 1 Monofilament extrusion line.

shrinkage at 350° F. to be down to about 7.5%. Shrinkage can be reduced still further by relaxing and heat-setting the filament in an auxiliary relax oven. This oven, identical in construction to the drafting oven, relaxes internal stresses in the filament. If a relax oven is used, it must be followed by treatment with an additional set of rolls which rotate slightly slower than the drafting rolls.

Extruding polypropylene monofilament

In choosing extrusion conditions, the processor must consider the top capacity of his equipment. The polypropylene formulations which produce the strongest monofilaments have low flow rates (1.8-2.5 degrees/min.)# and, therefore, require higher pressures and temperatures than those having a higher rate of flow. For fine denier monofilament, improved processing may be obtained by sacrificing a little tenacity and using a polypropylene with a high flow rate.

Flow Rate, ASTM-D1238, 2.16 kg load @ 230° C.

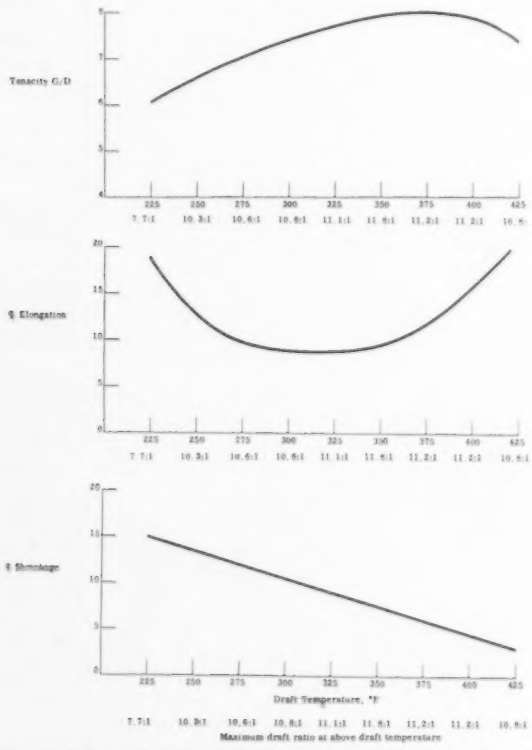

Fig. 2. Effect of draft temperature on filament properties at maximum draft ratio.

The most significant effect of extrusion conditions is in uniformity of monofilament. Uster evenness (a measure of monofilament uniformity) remains at about

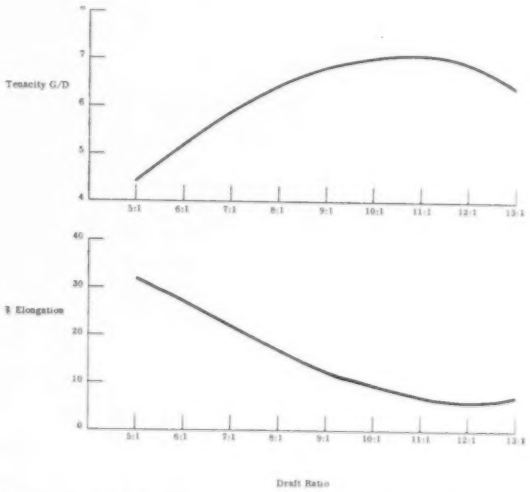

Fig. 3 Effect of draft ratio on filament properties using constant draft temperatures of 300° F.

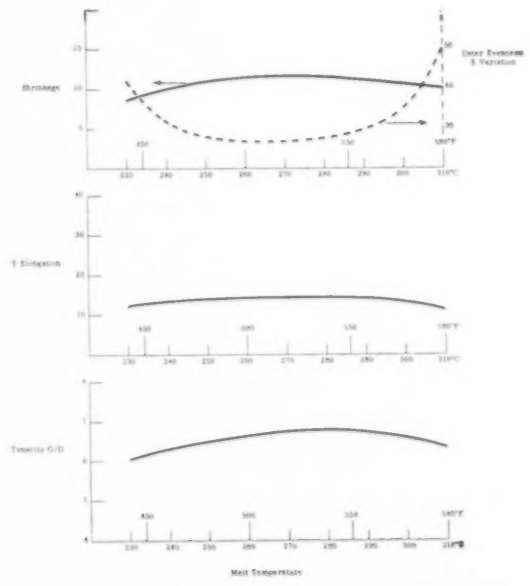

Fig. 4. Effect of melt temperature on filament properties using a constant draft temperature of 300° F. and a constant draft ratio of 9.8:1.

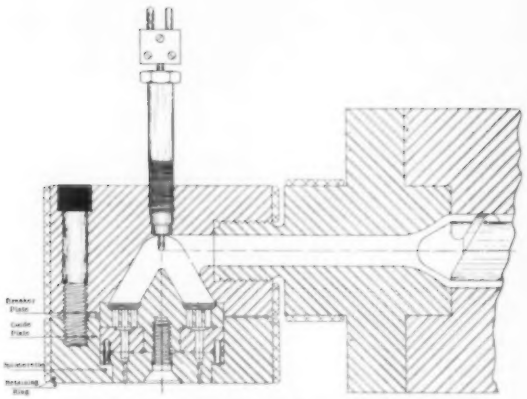

Fig. 5. Diagram of typical monofilament die.

28% over a relatively wide range of temperature (Fig. 4). When it does rise, however, it rises sharply and becomes a limiting factor at both low and high temperatures. These temperatures are 240° C. and 300° C. for the data plotted in Fig. 4. Melt temperature has almost no effect on tenacity, elongation, and shrinkage.

Polypropylene with a flow rate down at 2.5 degrees/min. was found to extrude well at a temperature of 500° F., and at pressures of 800-1,200 psig. Pressure was measured at the gate section and temperature at the die. The polyethylene metering-type screw used had a 4:1 compression ratio, constant pitch, and increasing root diameter. The screen pack consisted of a 38 by 38 mesh screen, a 56 by 56 screen, and a 100 by 100 mesh screen.

The orifice section of the extrusion die has three parts: breaker plate, guide plate, and orifice plate (Fig. 5). A bolt holds these three parts together as a single assembly and a retaining ring fastens it to the die body. A new assembly should be designed for each monofilament size to be extruded. Although monofilament size can be changed 1-2 mils by changing the amount of drafting, this has an adverse effect on tenacity.

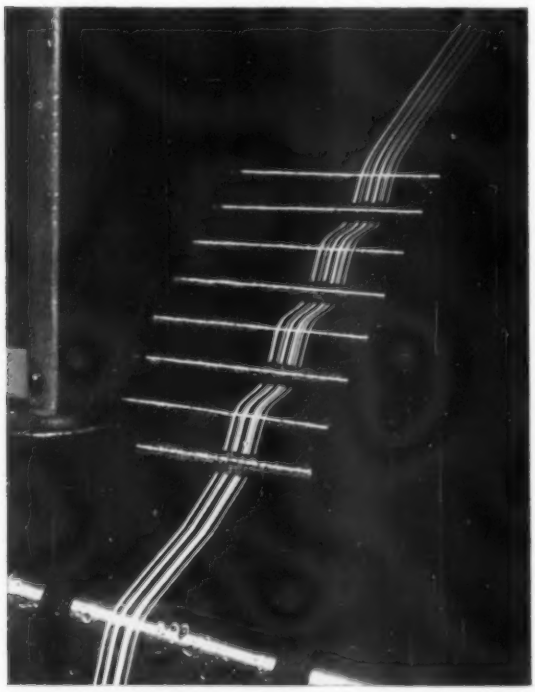

Fig. 6 Guide bars keep monofilaments from crossing each other as they travel up and out of the quench bath.

Fig. 7. Pull-out rolls extend at a slight angle to each other and thereby advance the filaments. Both rolls are 6 in. in diameter and are geared to run at the same speed. Draft rolls and relax rolls are of identical construction.

Emerging from the die, the molten monofilaments pass into the quench bath. A relatively warm bath produces monofilaments of the highest uniformity and roundness. To avoid localized boiling, the temparture of the bath should not be raised above 120° F. Electrical heaters immersed in the bath maintain this temperature.

(*Continued on page 45*)

Fig. 8. Each spindle in this multiple wind-up unit is driven by an electric, constant torque motor. A common powerstat controls the torque of all motors.

IRVIN I. RUBIN*

Specialization—Key to design of injection machinery

This article, by an injection molder, reflects his views of the injection molding machine. Recent innovations, such as the in-line screw plasticizing machine, have caused molders to take a new look at machinery as well as their own directions and capabilities. Now is the time to evaluate your equipment and make sure you remain competitive.—Editor.

There is no longer a general purpose injection molding machine. As recently as 10 years ago, most custom molders would mold anything that came along on the same machine—pieces which were usually acceptable to the customer. It is to the credit of machine designers that their units still can mold most materials, but the competitive situation is such that they can no longer compete with specialized machines. With current engineering requirements and rigid specifications, proper equipment is not just a question of economics but of the ability to do the contracted job. This is equally true for captive operations, even though the economics are not always as readily apparent.

Most molding plants have begun to specialize, often without any conscious realization. This has been dictated by the nature of their equipment and the orientation of their sales and operating personnel. They were able to produce a particular item more economically and with better quality, and thus became oriented to seeking such jobs.

An excellent time to evaluate the direction and capabilities of the molding plant is when considering the purchase of new equipment. This evaluation should include, among other things, classifying sales in terms of industry, the relative value of quality and precision, staff efficiency, quality control, materials molded, cyclic nature of the items, background and training of the sales force, and the economic goals of the company.

* Vice-President, Robinson Plastics Corp. and Robinson, Lewis & Rubin, Inc., New York, N.Y.

Factors affecting machine selection

A plant specializing in molding heavy sectioned industrial items with 35-120 sec. cycles would be less interested in the dry cycle time than one molding thin parts at 8-12 sec. cycles. A polystyrene molder would be less interested in a screw type plasticizing machine than the molder of rigid vinyl. For some, reliability and reproducibility of the molding conditions are paramount, while for others it is much less important. An analysis of the non-successful bid might show that the sales force had excellent contacts in a specific area, but were unsuccessful because of high quotes based on equipment which did not match the job. It might pay to purchase the proper equipment and take orders at competitive prices—even though they might seem low. This would familiarize management with the production potential in an area not previously entered. While not a good idea for a plant expanding from 8 to 9 machines, it might be excellent for a plant going from 35 to 36 machines.

In discussing a new machine, management should include sales estimating, engineering, and maintenance personnel. Their evaluation of existing equipment is basic to management's decision, and the psychological approach to a machine is important. The author is very happy with a machine (made by manufacturer A) which he purchased from a friend whose plant had only machines of manufacturer B. The plant personnel, not knowing the new machine as well as their other ones, tended to shy away from it and used every

excuse to criticize it. He sold it, not because of poor quality, but because of the attitude of his operating personnel.

Once the need for new equipment is established, with the requirements outlined in writing, its selection becomes easier. If it is to replace existing capacity, however, the question arises as to whether it might not be better to rebuild and modify existing equipment. This is not only a question of economics, but of having a machine designed more specifically for the required service than a commercial unit. In some instances, the molder might not be able to wait for delivery (1) (2).*

Many manufacturers are now offering separate units for the clamp and injection ends which can be matched with other units in their line. Both stock and custom heating cylinders are available from companies specializing in their manufacture. The injection end, with or without preplasticizing, is similarly available. It might well be that the clamping mechanism can be rebuilt at a minimum expense. Changing circuitry on most machines is relatively simple as is the mounting of a new injection head. In estimating costs, allow time to work out the unforeseen difficulties which will definitely arise.

If you need a new machine and have predominantly machines of one make, the next question is whether to buy from a different manufacturer. A limiting factor is the caliber of plant maintenance personnel, facilities, and control. All things being equal, and particularly in medium or large sized plants, the author leans towards equipment of another manufacturer. You get a different slant on injection equipment, and a chance to compare different machines. A different machine sometimes proves the answer to a tricky mold.

The disadvantages (and they are considerable) are that the machine might not live up to expectations, the workmanship might not be as good as the existing manufacturer's, and the maintenance and repair costs might be considerably higher. There is the added handicap of operating and maintenance personnel being unfamiliar with the new unit. This is a very controversial point.

One basic question is—should the machine be vertical or horizontal? Vertical machines are bought mainly for insert work and their excellent adaptability in automatic degating and sorting of family molds. A disadvantage is the large number of custom molds built for horizontal machines.

The best quality instrumentation and special features required should be purchased with the machine, or added immediately in the plant. This does not imply that the most expensive is necessarily the best, nor that the same or similar features in two different machines should be evaluated by cost alone. It does mean though that the first cost is probably the lowest.

Safety is a key factor

The molding machine is a truly dangerous instrument; no management can do anything less than insist on maximum safety precautions being built into the machine. At the very least, every machine should have hydraulic and electrical interlocks so that it cannot be operated unless the front and back safety gates are closed. Its back should be fully protected so that there is no possibility of anyone slipping and falling into clamping rams, toggles, or other moving parts. The safety gate should be high enough so that the operator cannot get his hand over the top and caught in the machine. Some companies, such as Reed Prentice, have gone to great lengths to devise special circuits to prevent accidents. This attitude deserves commendation and support.

Another factor closely related to safety is color. Extensive research by Pittsburgh Paint and others shows that a green machine with markings in orange and yellow contribute to safe operation. Also, controls for purging should be located so that the operator is not in direct line with the hot material being forced out of the cylinder. The Workman's Compensation Insurance carrier should be consulted for safety recommendations. In some instances, these recommendations might appear severe, but a presentation of your objections will usually result in acceptable modifications.

Design specifications

One point so obvious that it is sometimes overlooked is part accessibility. Unfortunately, the men who design machines are rarely the ones who service them. I have seen machines where it was necessary to disconnect and remove a large pump to repair packing between two parts in the hydraulic system. The alternate solution was to cut out a 2- by 2-foot opening in the machine bed for access to the flange. Unfortunately, this is by no means uncommon on molding machines. It is definitely worth while to have your maintenance department scrutinize a machine before purchase. Many objectionable features can be overcome at little or no cost before the machine is ordered.

The same applies to electrical components. The wires leading to them should be numbered for easy identification, and all components should be readily accessible from the front. Fluorescent lights inside the control panel, neatly and legibly labeled components which correspond to the prints, and room for adding components are definite plus factors.

Most machines conform to JIC standards, but these are minimal and in no way limit additional quality. The purchaser should be familiar with both the electrical and hydraulic standards.

Molding machines have specifications, a number of which are rigid physical measurements or descriptions such as weight, machine and platen dimensions, clamping stroke, pump, motor, and type of heat control. Since this article is directed to molding machine owners, a discussion of such items is unnecessary.

There are, however, specifications which are subject to considerable interpretation, the most important being plasticizing capacity or injection rate in pounds per hour. There is no accepted, standardized method for its determination. Many plastic engineers are working on this problem, but until such time as they develop an acceptable method, the purchaser will have to be very

* Numbers in parentheses refer to Bibliography at end of article.

wary of these figures. Ratings are usually given for polystyrene and should be so stated.

Unfortunately, not all purchasers are aware of the lack of standard ratings. Competitive pressures can result in a manufacturer using a figure on the high side. Therefore, the molder should not be unduly influenced by comparative figures, though most are essentially fair. Unless the proposed application is one where the limiting factor is the amount of material plasticized per hour rather than material cooling, the molder need not be too concerned about ratings.

The best source of accurate information is another molder who uses the machines. Another method is to ask the machine manufacturer to run the item in question on his machine in his plant. The plasticizing rate of a given cylinder changes with each type of material. A machine molding 100 lbs./hour in styrene will only mold 60 lbs./hour in some olefins. In addition, one cylinder might be more efficient in one material than in another. The ratings of screw machines have not yet stood the test of large-scale American evaluation and, while there is no reason to disbelieve a manufacturer's rating, some caution should be exercised.

Injection pressure

The injection pressure is another specification that is not too meaningful in conventional plunger machines. What is actually given is the pressure on the material by the injection ram. This does not take into account pressure losses in the cylinder. The important pressure is the one exerted on the plasticized material before injection, and this depends on cylinder design. There is no rating for that as yet. Another specification of limited value is the wattage on the heating cylinder. This does not tell very much, as the type of heater, its efficiency, the amount of heat lost through radiation and convection, and the amount of time that the heater is on are all pertinent to this kind of specification. Its main use is to determine the size of electrical connections.

Clamping pressure

Clamping tonnage is an important specification. In hydraulic clamps, it is easily determined by multiplying the oil pressure (psi.) by the area of the clamping ram (sq. in.) and dividing by 2,000. In toggle systems, it can only be determined by actually clamping a piece and using a pressure transducer or similar instrument. The clamping pressure of a toggle system is given when the toggles are new, and wear changes this force without it being realized.

There is a great deal of discussion regarding toggle versus hydraulic clamp. The toggle system is less expensive initially, but has a higher maintenance cost. The hydraulic clamp has some distinct advantages. As mentioned, the clamping pressure is always determinable and can be varied in infinite steps within the range of the system. A properly designed hydraulic clamp will move more rapidly than a toggle, but the difference is rarely significant. The hydraulic system permits easier deceleration, speed control, low pressure closing, and faster mold set-up. The maintenance of a hydraulic clamp consists of changing the packing periodically. Since the piston is always floating in oil, no lubrication is needed.

Machine ratings

The rating in ounces/shot or cubic inches/shot is accurate and important. The dry cycle time of a machine is the amount of time it takes to complete a cycle of machine motion with no material in the cylinder. This is a good indication of the relative mechanical speed of a machine. The moving time of the clamping mechanism will be very close to that in actual production. The speed of injection with material in the cylinder can vary considerably among machines with equal dry cycle injection times. The availability of pumping capacity, pressure of the machine, and resistance of the material in the cylinder have a lot to do with it.

Stuffing, a method by which the plunger reciprocates and adds material during the clamping cycle, increases the single shot feed capacity. This is what is meant when a machine for example is rated 12 to 16 ounces; the former being the regular rating, and the latter with the plunger prepack. Most machines have a positioning control for the injection plunger which permits it to move forward and precompress the material slightly. The plunger then has less distance to travel for the injection stroke.

Mechanics of heating

The heating cylinder or plasticizing chamber is the most important part of the machine. The remainder of the machine is merely a device to utilize this function of the cylinder. For this reason, its instrumentation and heating are very important. Many plasticizing chamber designs are in use due to the differences in thermal properties of plastics and in the design approach. Their controls and methods of applying heat, however, are similar. The control of plasticizing is so critical that the best instrumentation and heat sources should be used. While this is unquestionably more expensive, it will quickly pay for itself.

In the early days of molding, the heat control instrument was a thermocouple activating a straight on-off type controller. When the preset temperature was reached, the controller would cut off the heating unit. When the thermocouple indicated a temperature below the set temperature, the heater would be reenergized. This gave relatively poor control of the heating cylinder. When the set temperature was reached, the thermal energy from the outside heating band continued traveling through the steel even though the heat was off. The inside wall temperature went well over that of the set point. The converse was true when the heat was shut off.

A great improvement was made when proportioning type controls were installed. By various electrical means the heat requirements of the cylinder were anticipated and the controller went on or off before the desired set temperature was reached. This corrected the overide of thermal energy. Most machines today utilize this type of control.

Recent'y, a superior system has become commercially available. It consists of a magnetic amplifier which

feeds the control windings of a saturable core reactor. The amplified voltage from the thermocouple is corrected for the thermal inertia as in the previously described system and used to drive the magnetic amplifier. There are a number of outstanding advantages which make it very desirable for heating cylinder control.

In an on-off controller, the heat is off for a set time, and on for a set time while the temperature varies within a specified limit. Using reactors, the system automatically increases or reduces the heat output of the heating element without shutting it off. Since the output voltage is directly related (ultimately) to the thermocouple reading, continual power will be applied to the cylinder in such an amount as to keep the temperature constant within much narrower limits. This, in itself, is an important advantage. Secondly, heating unit failure is primarily caused by on-off cycling. The reactor, by providing enough current at all times to maintain the proper temperature, eliminates cycling and cuts down thermal shock. This lengthens the service life of both heater and cylinder.

The magnetic amplifier-saturable core system has no moving parts. This means a rugged system, highly resistant to mechanical shock, which can be operated with virtually no attention. The disadvantages of such a system such as relatively slow response and a lack of absolute linearity are not detrimental to its use in the molding machine. It does cost approximately three times as much as a proportioning on-off controller, but will last longer than the machine.

The heating elements for the cylinder are often mica insulated resistance heaters which have a relatively short service life. Tubular heaters are much superior, installed in a machined groove on the cylinder or cast in aluminum rings. Their heat transfer, a measure of the electrical heating efficiency, is much superior to band heaters. They can last a long time if properly designed against overloading. I know of many instances where tubular heaters have been installed on heating cylinders and operated 12-15 years without failure. It is advisable to have the heaters rated at a slightly higher voltage than the supply voltage; for example, a 230 volt heater on a 220 volt system or a 220 volt heater on a 208 volt system. While this reduces heat slightly, modern cylinders are so designed that this will not be objectionable.

With the advent of screw plasticizing, thought should be given to the use of induction heat for the barrel. Extruders have successfully used this method for many years. There are a number of inherent advantages compared to the use of heating elements. Experimental work has been done in Britain using induction heating for conventional plunger type cylinders. Up until now, cooling has not been necessary for screw type plasticizers used in injection molding. Should future development require it, many cooling means are available.

Injection speed

Another important feature of a machine is the injection speed and its control. Clamping speed affects the quantity of parts produced; injection speed both quantity and quality. Not all items benefit from rapid injection speed, but a surprisingly large number do. One will never know this unless his machine is capable of rapid mold filling.

There are two basic ways to attain high injection speeds: accumulator and auxiliary pumps & motors. An accumulator supplies the necessary volume and pressure at the right time. They are charged at a point in the cycle when pumping capacity is available, or by an added small vane-pump. The bladder-type accumulator separates the gas (usually nitrogen) from the oil by means of a flexible diaphragm; the piston type uses a floating piston.

Although gravity-loaded accumulators have much to offer, their size and weight make them somewhat prohibitive. Accumulators are common on European machines and will probably become so here as additions to existing machines. The circuit of the proposed machine must be understood to determine how easy or difficult it will be to add one at a later date. Panel, mounted hydraulic components make this more difficult than point-to-point piping. If the addition of an accumulator is anticipated, the machine manufacturer may be able to modify the piping for easier installation in the molders plant.

Like the accumulator, auxiliary pumps and motors provide the necessary volume of oil at the right pressure. Choosing between the two methods of obtaining rapid plunger speed will depend on materials used, and items to be molded as well as economic considerations. Newer hydraulic circuit design permits the cylinders to move with great rapidity. This should be investigated with the machine manufacturer to determine whether the optimum speed of movement is available. If not, the molder might want to know what can be done either before the machine is bought or later in his plant should this extra speed be desirable.

Electrical and hydraulic circuits should be thoroughly understood. This is not only important for comparing the features of different machines, but determinging what modifications, if any, are required to achieve certain results.

Electrical and especially hydraulic checkpoints reduce maintenance and repair time. Very often, the insertion of a pressure gage at a particular spot or a port (which can be opened to see if oil is flowing in a particular line) can cut maintenance from hours to minutes. If gage insertion becomes a major plumbing job, maintenance personnel will obviously try to avoid it and find the trouble by some "easier" way.

Which machine do I buy

Machine versatility is enhanced by such features as a machine stop before the knock out, pressure reduction at the end of the injection stroke, low pressure closing, mold opening slow down, hydraulic core pulling, adequate clearance under the mold for automation, hydraulic knock outs on the stationery side, ports for hydraulic fluids, low noise level, extra wire connections in the terminal box for adding circuits, wiring for thermocouples and heaters at the platen area (for control of hot runner molds), 120 volts outlets on the machine for lights and auxiliary devices, etc.

The above list can be added to depending on molder

needs. Then, consult the machine manufacturer. Don't forget cooling capacity. Oil should be kept at the right operating temperature by cooling tower water (which in the summer time may run as high as 95° F.).

The burning question in the minds of molders contemplating machinery purchases today is how to evaluate screw preplasticization. The terminology is quite confusing. The author recommends the following terms to describe present machines: The conventional heating cylinder has a plunger and torpedo, and could be called a conventional plunger machine. When this cylinder (with torpedo) is used to charge a shooting cylinder without torpedo, the machine can be described as a plunger-plunger machine. From a terminology standpoint, it is unimportant whether the plasticizing cylinder is above, below, or at right angles to the shooting cylinder.

If a screw is used to plasticize material which goes into a shooting cylinder without torpedo, it is a screw-plunger machine. Again, the location of one in relation to the other is not important. If the screw is in line with the mold, and its plasticized material is collected in front and shot into the cylinder either by the reciprocating action of the screw or the barrel, it is an in-line screw machine. If a conventional plunger cylinder has a plasticizing chamber in front (in line with the mold), and the shooting is done by means of a reciprocating plunger, it is an in-line plunger machine. If the spreader (torpedo) rotates, it is a rotating spreader machine.

The literature on preplasticizing by plunger and screw methods is rapidly growing. For an excellent review of preplasticizing injection molding machines the reader is recommended to the series of articles by E. G. Fisher and W. A. Masler (3). For information on an in-line plunger preplasticizing machine, refer to an article by Albert Spaak (4). In-line screw preplasticizing machines are described in an article by H. Frimberger and J. G. Fuller (5) and A. R. Morse (6). A method of plasticizing intermediate between the screw and plunger is the rotating spreader developed by DuPont. This is described in an article by Keiser, Cirker, and Kohl (7).

A newcomer to plastics visiting the recent SPI exhibition at the Coliseum would conclude that only screw machines are available. The overwhelming acceptance of this principle by the American machinery manufacturer will indicate that this type of plasticizing is a valuable new tool for the molder and is here to stay. It would be hard to disagree with this conclusion, but the exact place for the screw machine in the American injection molding plant is yet to be determined. A real comparison of the screw machine with other preplasticizing systems has not been made to my satisfaction. They have only been compared with conventional plunger machines. As has been pointed out before, American production requirements are somewhat different from Europe's (where in-line screw plasticizing machines predominate).

I have seen unpublished data comparing a plunger-plunger and a screw-plunger plasticizing machine which favored the former in some materials. While these are only preliminary results, it points out the importance of a very thorough investigation before buying a machine. The generous offer of machinery manufacturers to test molds on their equipment should definitely be accepted. Comparisons can thus be made with all types of preplasticizing equipment for specific applications.

Should a molder purchase a preplasticizing machine? If he does not already have one, the answer most often should be yes. The next question is—which type machine? The plunger-plunger machine is not new (10 years), and its performance is well known. Screw-plunger machines are relatively new. Their mechanical performance should be good and, if a number of bugs develop, they should not be too difficult to iron out based on the experience with the plunger-plunger machine. Machinery manufacturers who manufacture both would be in a good position to make positive recommendations based on experience with these two types.

The in-line screw machine has not had the benefit of extended American operation. It does offer certain operating advantages, particularly in color and material changing. There are some major mechanical questions as yet unanswered. The in-line screw machine is new to operating and maintenance personnel as is the rotating spreader.

The nature of the material used will have a direct bearing on the choice. Rigid PVC, for example, requires screw type plasticizing. The crystalline materials probably will have certain molding advantages, though this has yet to be proven. These remarks show that not enough fundamental information is available on the newer screw machines for an accurate analysis and appraisal.

Again, find out who is using the machine you are contemplating buying. Get his views on its performance. Most molders will be glad to discuss and evaluate a specific piece of equipment with a fellow molder and invite you to view it in operation.

Purchasing a machine is always an important and interesting event in a molding plant. It should be used to good advantage to review the planning and requirements of your whole operation.

Bibliography

(1). "How to Speed Up Older Injection Machines," A. R. Morse, **SPE Journal**, Dec., 1958, pgs. 27-30.

(2). "Cycle Improvement by Machine Modification," Milton A. Sanders, **SPE Journal**, Nov., 1959, pgs. 989-990.

(3). E. G. Fisher and W. A. Maslen, **Brit. Plastics**, Sept., 1959, pgs. 417-424; Oct., 1959, 468-474; and Nov., 1959, pgs. 516-520.

(4). "Preplastication," Albert Spaak, **Modern Plastics**, Oct., 1960, page 107 (5 pgs.).

(5). "Single Screw Injection Molding," H. Frimberger and J. G. Fuller, **PLASTICS TECHNOLOGY**, May, 1961, pgs. 53-62.

(6). "Movable Screw Plasticizing Boom," A. R. Morse, **SPE Journal**, June, 1961, pgs. 539-544.

(7). "The Rotating Spreader—A Device for Injection Molding," Keiser, Cirker, and Kohl, **SPE Journal**, April, 1961, pgs. 340-344.

—THE END

PT's Comparative Data on 1961 Injection Molding Machines.

(Based on data submitted by the machine manufacturers.)

Manufacturer	Ankerwerk ##						Battenfeld ##			
Machine model	V14-60	V20-140	V25-200	V42-550	V74-650	V90-1150	BSM 108 VP	BSM 100 VP	BSM 300 VP	BSM 600 VP
Machine action	Auto.	Auto.	Auto.	Auto.	Auto.	Auto.	Auto.	Auto.	Auto.	Auto.
Machine type	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.
Clamping mechanism	Toggle	Toggle	Toggle	Hydr.	Hydr.	Hydr.	Hydraulic clamp. →			
Injection capacity, oz./shot	1 - 3	3 - 7.4	5 - 15	18 - 44	35 - 94	53 - 150	0.5	7	27	64
Casting area, sq. in.**	38.74	85.25	139.50	400	480	800	9	54	116	279
Injection plunger: Stroke, in.	- - -	- - -	- - -	- - -	- - -	- - -	2-3/4*	1-5.5	- - -	- - -
Plunger speed, in./min.	- - -	- - -	- - -	- - -	- - -	- - -	0.97	2.24	- - -	- - -
Pressure on material, psi.	15,600-6,400	17,800-7,300	17,200-6,400	19,900-8,000	18,900-6,950	19,200-6,750	- - -	- - -	- - -	- - -
Injection rate, lbs./hr.	- - -	- - -	- - -	- - -	- - -	- - -	14,200	17,800	17,800	17,800
Plasticising capacity, lbs./hr.***	50	70	165	285	385	500	5½	44	99	154
Cycles per hour	1,600*	450*	400*	160*	160*	120*	900#	480#	240#	120#
Mold: Size, in.	11.8x12.2V 18x5x5.5 H	14.17x19.7V 22.05x11.8H	15.9x24.5V 24.5x15.9H	33½x52V 52x33½H	33½ x 52V 52 x 33½H	41½ x 62V 62 x 41½H	7½ dia.*	14 x 16*	19 x 23*	31 x 46*
Daylight opening, in.	20.5	27.95	29.9	52.15	52.15	84.64	5.29*	12*	15-3/4*	20*
Thickness (min.-max.) in.****	6.7-10.6	9.45-13.78	9.4-14.2	13.73-24.6	13.73-24.6	19.7-37.4	- - -	- - -	- - -	- - -
Locking force, tons	66	154	220	605	715	1,265	13½	99	200	450
Clamping stroke (min.-max.) in.	9.8 max.	14.17 max.	15.7 max.	27.55 max.	27.55 max.	47.24 max.	4.23	9½	15-3/4	24
Clamp tie bars or rods: Diameter, in.	2.05	2.56	3.07	- - -	- - -	- - -	1-3/8	2½	4	5½
Space between (V x H), in.	11.8x5.5	14.17x11.81	15.9x15.9	33.5x33.5	33.5x33.5	41.5x41.5	3-1/8 x 7-7/8	9-3/8 x 14¢	14 x 19-1/8	24½ x 31-1/4
Hopper capacity, lbs.	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
Cylinder heating capacity, kilowatts	4.1**	6.5#	7.7##	15##	40***	45***	1½	3.8	7.0	15
Motor hp.	6 + 6½	4½ + 13	7½ + 15	15 + 41	27½ + 41	36-3/4+30	0.89;2**	5.2;4.1**	16.8;5.5**	33.1;10**
Oil tank or reservoir capacity, gals.	84	96	98	220	286	352	- - -	- - -	- - -	- - -
Special features (no extra cost)	Reciprocating single-screw injection; infinite variable hydraulic control of pressure & speed on clamp & injection, & screw back-pressure during plasticizing; adjustable automatic sprue-breaking movement; adjustable mold thickness; automatic retraction of ejectors. →						Screw plasticizing. → Also available in vertical design. → (See next pg.) Electronic timers. Built-in safety devices. → Top-mounting plasticizer. →			
Optional features (at added cost)	Special cylinders & shut-off nozzles; Hydr. core-pulling device. →						- - -	- - -	- - -	- - -
Machine dimensions (W x D x H), ft.	9-1/3 x 3 x —	12½ x 4-2/3x —	14½ x 5½ x —	24 x 6½ x - -	30 x 6½ x - -	36½ x 7½ x —	4-3/4 x 2½ x —	10 x 3½ x —	13-1/8 x 4 x —	16-2/3 x 8½ x —
Approx. delivery time, weeks ###	4 - 8	4 - 8	4 - 8	16 - 24	16 - 24	16 - 24	10 - 20	10 - 20	10 - 20	15 - 25

* Dry cycling.
** Three zones.
*** Six zones.
\# Four zones.
Five zones.

* Maximum
\# Dry cycle, max.
** Screw plasticizing unit.

* Complete manufacturers' names and addresses are as follows:

Ankerwerk International - Krauss-Maffei International, 2 Hamilton St., Bound Brook, N. J.
Battenfeld Corp. of America, 959 W. Grace St., Chicago 13, Ill.
B.I.P. Engineering Ltd., England (Distributed by Ralph B. Symons, Inc., 3571 Main Road, Tiverton, R. I.
The Buhler Corp. 4207 Nicollet Ave., Minneapolis 9, Minn.
Clifton Hydraulic Press Co., 287 Allwood Rd., Clifton, N. J.
Conapac Corp., 120 E. 13th St., New York 3, N. Y.
Crown Machine & Tool Co., Inc., P.O. Box 245, Fort Worth, Tex.
De Mattia Machine & Tool Co., Chelsea Rd., Clifton, N. J. (Distributed by Acme Machinery & Mfg. Co., Inc., 500 Saw Mill River Parkway, Yonkers, N. Y.)
Fellows Gear Shaper Co., Springfield, Vermont
#Guy F. Harvey & Son Corp., 40 Spruce St., Leominster, Mass.
H-P-M Div., Koehring Co., Mount Gilead, Ohio
Improved Machinery, Inc., Nashua, N. H.
Lester Engineering Co., 2711 Church Ave., Cleveland 13, Ohio
#Lewis Welding & Engineering Corp., 104 Northfield Rd., Bedford, Ohio
Lombard Governor Corp., Ashland, Mass. (Distributed by The Rainville Co., 839 Stewart Ave., Garden City, N. Y., in Ala., Ark., Conn., Fla., Ga., Ill., Iowa, Kansas, La., Md., Miss., Mo., Neb., N.J., N.Y., No. Car., So. Car., Pa., Va., W. Va.
Maslo Machinery Co., 2443 Prospect Ave., Cleveland 15, Ohio
National Automatic Tool Co., Inc., Plastics Machinery Division, Richmond, Indiana.
Newbury Industries, Inc., Route 87, Newbury, Ohio
Reed-Prentice Division, Package Machinery Co., East Longmeadow, Mass.
Simplomatic Mfg. Co., 4416 W. Chicago Ave., Chicago 51, Ill.
Standard Tool Co., 217 Hamilton St., Leominster, Mass.
F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa.
Van Dorn Iron Works Co., Plastic Molding Machine Div., 2685 E. 79th St., Cleveland 4, Ohio
Watson-Stillman Press Div., Farrel-Birmingham Co., Inc., 265 Blossom Road, Rochester 10, New York
R. H. Windsor of Canada, Ltd., 56 Advance Rd., Toronto 18, Ont., Canada

** Casting area is dependent on the injection pressure used for the different materials in relation to the clamping capacity of the platens, and the mold construction.

*** Plasticizing capacity varies broadly with material selection, part design, injection speed, and mold cooling.

**** Determined by die thickness and adaptor (bolster) plates.

\# Despite repeated requests for data on their machines, material was not received in time for inclusion in this tabulation.

Has more machines in addition to tabulated models.

Delivery time, as well as prices, should be substantiated in a formal quotation from the manufacturer.

Manufacturer*	Battenfeld ## (Cont'd.)		BIP	Buhler		Clifton	Conopac			Crown
Machine model	BSM 3000 VP	BSM 10,000 VP	4/6	Rover 175	Rover 350	357	Rotojet T5	Rotojet T25	Rotojet T50	Moldmaster A7
Machine action	Auto.	Auto.	Auto.	Auto., semi-auto.		Auto.	Auto.	Auto.	Auto.	Auto.
Machine type	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.
Clamping mechanism	Hydraulic clamp.		Hydr.	Toggle	Toggle	Toggle	Hydr.	Hydr.	Hydr.	Hydr.
Injection capacity, oz./shot	170	350	4/6	10;16;16	20;35;35	2-3/4	0.2	1	1.9	1-3/rem
Casting area, sq. in.**	600	1,400	60	- - -	- - -	- - -	1.4	8.5	17.8	Approx. 50
Injection plunger stroke, in.	- - -	- - -	10	- - -	- - -	7	- - -	- - -	- - -	4
Plunger speed, in./min.	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1,200
Pressure on material, psi.	- - -	- - -	19,000	14,000; 8,000; 22,000	14,000; 10,000; 22,000	20,000	- - -	- - -	- - -	15,500-28,000#
Injection rate, lbs./hr.	17,900	17,900	8.25#	- - -	- - -	- - -	10	45*	45**	Up to 100
Plasticizing capacity, lbs./hr.***	154	260	60	90*	130**	50	10	45*	45**	100
Cycles/hour	80#	60#	1,000*	240#	180#	780	3,600	2,100	1,500	1,800 max. (actual)
Mold: Size, in.	39x52*	53x65*	14 x 22	24 x 24	33 x 33	12 x 12	2½ dia.	5-3/8 dia.	7-3/4 dia.	18 x 18
Daylight opening, in.	27½*	35*	15 - 21	14½	20½	6-3/4	3 - 5½	6½ - 9-3/4	9-7/8	16-3/4x16½
Thickness (min.-max.), in.****	- - -	- - -	20 max.	22	30	4-12	- - -	- - -	- - -	- - -
Locking force, tons	800	1,800	134	175	350	75	6½	27½	50	105
Clamping stroke (min.-max.) in.	31½	55	6 - 12	- - -	- - -	- - -	1/4#	1/4#	1/4#	0 - 10-3/4
Clamp tie bars or rods: Diameter, in.	- - -	- - -	- - -	2.9	3.9	2½	2½	4	4	3
Space between (V x H), in.	- - -	- - -	14.25	15 x 15	19 x 19	6 x 13½	- - -	- - -	- - -	10
Hopper capacity, lbs.	- - -	- - -	75	- - -	- - -	20	- - -	- - -	- - -	80
Cylinder heating capacity, kilowatts	- - -	- - -	7.2	9	14	6½	2	0.45	5.2	10
Motor hp.	25;—	69;—	20	21	34	10	3 - 5	5 - 10	5 - 10	30
Oil tank or reservoir capacity, gals.	- - -	- - -	100	- - -	- - -	40	13	53	53	135
Special features (no extra cost)	Screw plasticising. Side-mounting plasticiser. Electric timers. Built-in safety devices.		- - -	Single-screw inj.unit. Hydr. cross-slide for deep-draw moldings. Hydr. back-press cyl. for control of matl. shear.		Adj.matl. metering. Prepack control.	Screw-type preplasticiser with separate transfer to injection cylinder.			Twin injection rams. Preplasticizing.
				2½" screw dia.std.	3" screw dia.std.					
Optional features (at added cost)	- - -	- - -	- - -	1-3/4 or 3" screw dias.	2½ or 3½" screw dias.	- - -	Larger daylight openings, unthreading device.	Larger screw dias., piston to aid mold opening & ejection.		Choice of 3/4" & 1¼" plunger diameters.
Machine dimensions (W x D x H), feet	21½x10x—	- - -	4 x 14½ x 5½	15½ x 4 x 7½	20½ x 4-2/3 x 7½	7x2x5	- - -	- - -	- - -	3 x 13-3/4 x 7½
Approx. delivery time, weeks ###	15 - 25	15 - 25	10 - 12	- - -	- - -	6 - 7	- - -	- - -	- - -	4 - 6
	(See preceding page)		*Dry cycles #Cu.in./sec.	*With 2½" screw. **With 3" screw. #Max. shots per hour in medium molding conditions.			* 60 lbs./hr. with larger extruder screw. ** 66 lbs./hr. with larger extruder screw. # By a separate piston.			#On preplasticized materials.

Manufacturer*	De Mattia				Fellows				
Machine model	M-2	M2-PP32/48	J	K-2	3-125	6-200	6-10-225*	12-350**	12-450**
Machine action	Auto.	Auto.	Auto.	Auto.	Manual or	automatic.			
Machine type	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.
Clamping mechanism	Hydr.	Hydr.	Hydr.	Hydr.	Toggle	Toggle	Toggle	Toggle	Toggle
Injection capacity, oz./shot	12 - 16	32 - 48	2	4 - 6	3-4.5	6 - 9	6 - 10	12 - 20	12 - 20
Casting area, sq. in.**	- - -	- - -	- - -	50*	30	70	75	115	150
Injection plunger stroke, in.	11½	11½	- - -	7-3/4	5½	6½	10½	10½	10½
Plunger speed, in./min.	690#, 860##		- - -	362#, 228##	120	112	150	126	126
Pressure on material, psi.	22,500	22,500	14,000	20,250	20,000	20,000	19,380, 12,000*	20,000	22,500
Injection rate, lbs./hr.	150**	300**	- - -	100**	360#	5.25#	700#	1,044#	1,044#
Plasticizing capacity, lbs./hr.***	- - -	- - -	- - -	100	45	75	100	150	150
Cycles/hour	720***	720***	1,350***	620***	600-840	490-650	900-1,050	600-800	600-800
Mold: Size, in.	20 x 30	20 x 30	12 x 8	14 x 12	10x18 H 12x17 V	12 x 24H 15 x 21V	15 x 25	20 x 33	27 x 34 H 21 x 40 V
Daylight opening, in.	42	42	18	20	22	27	32	44	44
Thickness (min.-max.), in.****	36	36	12	- - -	14	14	18	24	24
Locking force, tons	400	400	52.5	150	125	200	225	350	450
Clamping stroke (min.-max.) in.	24**	24**	12	12	5 - 8	6 - 9	8 - 14½	10 - 20	10 - 20
Clamp tie bars or rods: Diameter, in.	- - -	- - -	- - -	- - -	2½	3	3½	4½	4½
Space between (V x H), in.	- - -	- - -	12 x 8	12 x 14	10½ x 12	12½ x 15½	15½ x 15½	20½ x 20½	27½ x 21½
Hopper capacity, lbs.	- - -	- - -	75	100	50	75	120	90	120
Cylinder heating capacity, kilowatts	20.5	20.5	- - -	10	6	12	13	21	21½
Motor hp.	30	30	15	20	15	20	30	40	40
Oil tank or reservoir capacity, gals.	160	160	- - -	150	120	100	160	125	125
Special features (no extra cost)	- - -	Model M-2 with piggy-back plasticator having 3½" screw.	- - -	Automatic prepack.	Rapid advance. Booster.		Two-way traverse on injection. Die height adjustment. Prepack.		
Optional features (at added cost)	- - -	- - -	- - -	Variable clamp.	Rapid advance.		Rapid traverse. (See footnote for all 5 models) Prepack.		
Machine dimensions (W x D x H), feet	3-2/3 x 19 x 6½		2-2/3 x 11x —	3-2/3 x 13½ x 7	14x2-3/4 x 6-3/4	15x4-1/3 x 6-3/4	16½x4½ x 7-1/3	22-3/4 x 5½ x 8	22-3/4 x 5½ x 7-2/3
Approx. delivery time, weeks###	2 - 3	2 - 3	2 - 3	2 - 3	- - -	- - -	- - -	- - -	- - -
	* Approximately. # Forward ## Return ** Maximum *** Dry cycle				* Approximately. # Forward. ## Return. **Maximum. ***Dry cycle. On first two models Rotary spreader, dual-pressure injection are optional. On last three models-Prepositioning, power pack are optional.				

Manufacturer*	H-P-M*						Impco ##	
Machine model	200-Ton Clamp	350-Ton Clamp	450-Ton Clamp	650-Ton Clamp	1,000-Ton Clamp	1,500-Ton Clamp	CB 30-75	HB 175 Series
Machine action	Semi-automatic						Auto.	Auto., Semi, or manual.
Machine type	Horizontal						Horizontal	
Clamping mechanism	Hydraulic						Toggle	
Injection capacity, oz./shot	(See Special Features below)						50 gms.	1-28 # & *
Casting area, sq. in.**	(See Special Features below)						- - -	- - -
Injection plunger stroke, in.	(See Special Features below)						- - -	Variable*
Plunger speed, in./min.	- - -	- - -	- - -	- - -	- - -	- - -	- - -	Variable*
Pressure on material, psi.	- - -	- - -	- - -	- - -	- - -	- - -	22,500	23,000*
Injection rate, lbs./hr.	675#	1,230#	1,590#	2,510#	3,920#	5,140#	- - -	12.6## & *
Plasticizing capacity, lbs./hr.***	(See Special Features below)						60	*
Cycles/hour	- - -	- - -	- - -	- - -	- - -	- - -	1,500**	1,200 max.**
Mold: Size, in.	26 x 26	34 x 34	42 x 42	48 x 48	60 x 60	72 x 72	- - -	13 x 20
Daylight opening, in.	21-29##	30-42##	36-50##	42-58##	57-79##	96-120##	- - -	22-3/4
Thickness (min.-max.), in.****	6**	8**	8**	12**	12**	34**	- - -	13-3/4
Locking force, tons	200	350	450	650	1,000	1,500	75	175
Clamping stroke (min.-max.) in.	15##	22##	28##	30##	45##	60##	9 adj.	5 - 9
Clamp tie bars or rods: Diameter, in.	4	4½	5½	6½	8	9½	3½	2-3/4
Space between (V x H), in.	15½ x 15½	20½ x 20½	27 x 27	30½ x 30½	39½x39½	48½x48½	- - -	13½ x 12½
Hopper capacity, lbs.	- - -	- - -	- - -	- - -	- - -	- - -	25	110
Cylinder heating capacity, kilowatts	- - -	- - -	- - -	- - -	- - -	- - -	10	15 max. * & #
Motor horsepower	30	60	70	110	180	240	15	45 max. * & #
Oil tank or reservoir capacity, gals.	- - -	- - -	- - -	- - -	- - -	- - -	30	110 max. *
Special features (at no extra cost)	Above clamp sizes are interchangeable with the following 4 types of injection: Conventional Plunger in 6/8, 2/16, 24/30, 32/42, 48/64, and 80/100 oz. injected per cycle, having a plasticizing capacity of 90, 150, 200, 300, and 400, respect.; 2-stage Plunger Preplasticizers in 28, 80, 140, 200 & 300 oz. inj./cycle, having a plasticizing capacity of 150, 200, 300, 300 & 400 resp.; Single-Stage Extruders in 15 & 40 oz. inj./cycle, having a plasticizing capacity of 150 & 300 resp.; & 2-stage Extruder Preplasticizers in 28 & 50 oz. inj./cycle, having a plasticizing capacity of 150 & 300 lbs./hr. respectively.						Photo-elec. recycling. Adj. knock out. Pre-press.-molding.	(See continuation below)
Optional features (at added cost)	Conventional plunger machines can be equipped with weigh feeders.						Special electr. props. & cycles. 2-stage injection.	Pre-press. molding. (Also see cont. below)
Machine dimensions (W x D x H), ft.	- - -	- - -	- - -	- - -	- - -	- - -	- - -	5-1/8x1½x8
Approx. delivery time, weeks ###	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

* Offers construction units to meet individual requirements (see Special Features).
\# Cubic inches per minute. ##Maximum. **Minimum.

See footnotes at bottom of continuation below.

Manufacturer*	Impco ## (Cont'd.)				Lester ##					
Machine model	MA 225 Series	MA 275 Series	ME 300 Series	MA 450 Series	L-2B-4/6	L-225-6/9	L-2A-8/12	L-100-2/3	L-400B-12/16	L-500-24/32
Machine action	Auto., semi-auto., or manual.				Auto.	Auto.	Semi-automatic		Auto.	Auto.
Machine type	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.
Clamping mechanism	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle
Injection capacity, oz./shot	1-35##*	1-50##*	1-40##*	1-72##*	4 - 6	6 - 9	8 - 12	2 - 3	12 - 16	24 - 32
Casting area, sq. in.**	- - -	- - -	- - -	- - -	50-60*	75-90*	100-120*	35-40*	135-160*	165-200*
Injection plunger stroke, in.	Variable*	Variable*	Variable*	Variable*	6-5/8	7½	10	5½	14	7.5
Plunger speed, in./min.	Variable*	Variable*	Variable*	Variable*	246	375##; 188###	171	446##; 227###	261	192##; 96###
Pressure on material, psi.	16,000*	23,000*	23,400*	20,000 max.*	20,000	20,000	20,000	20,400	20,000	20,000
Injection rate, lbs./hr.	22.5 ## max. *	22.4## max. *	16.9 ## max. *	44 ## max. *	678 #	#1,570##; # 792###	720#	852#	1,092#	#2,880##; #1,440###
Plasticizing capacity, lbs./hr.***	*	*	*	*	- - -	- - -	- - -	- - -	- - -	- - -
Cycles per hour	1,200* max.**	1,200* max.**	900* max.**	960* max.**	Approx. 767**	Approx. 857**	Approx. 410**	Approx. 975**	Approx. 379**	Approx. 497**
Mold: Size, inches	16½x15	16x25	19x25	24x26½	13-3/4x19½	16½ x 31½	23x31-3/4	12½x18 max.	25-3/4 x 25½	26-3/4x38
Daylight opening, in.	36	32½	30½	49½	21 max.	38 max.	26 max.	23-3/4	35 max.	60 max.
Thickness (min.-max.), in.****	20	18	18	25	9 - 12	7 - 22	13 - 16	13 - 16	21 - 28	9 - 30
Locking force, tons	225	275	300	425	150	225	300	100	400	450
Clamping stroke (min.-max.) in.	6 - 16	5 - 14½	5½ - 12½	6 - 24½	6 - 9	8 - 16	10	8-3/4	12 - 20	8 - 30
Clamp tie bars or rods: Diameter, in.	- - -	3-3/4	4	4-3/4	3½	5-3/8	6½	2½	6½	7½
Space between (V x H), in.	23-3/4 x 25-1/4	16-3/4 x 15-1/4	19½ x 16	26-3/4 x 24-1/4	14 x 12	17-3/8 x 20	23-1/4 x 18-1/2	23 x 18	25x18½	27 x 25
Hopper capacity, lbs.,	110	110	110	110	45	90	55	50	100	175
Cylinder heating capacity, kilowatts	20 max.*	23 max.*	20 max.*	29 max.*	11.3	20.9	11.7	16.2	16.2	38.5
Motor horsepower	50 max.*	55 max.*	55 max.*	85 max.*	25	30	30	25	50	90
Oil tank reservoir capacity, gallons	120 " *	125 " *	160 " *	125 " *	125	80	130	45	190	160
Special features (at no extra cost)	Lo-pressure closing. Feed baffle arrangement. Adjustable volume feed.				2-point ejection. Low pressure closing. Auto.cycling.					
					Compensating feed mechanism. Nylon molding.	Plunger advance. Retractable inj. end.	Compensating feed mechanism. Nylon molding.	Retractable injection end.	Plunger advance.	Automatic cycling.
Optional features (at added cost)	Screw plasticating. Special cycles.				Pneumatic die wipers.	Mold overload compensator.	Auto. cycling.			
						Outside ejection.				
Machine dimensions (W x D x H), feet	6-1/3 x 16 x 9½	5-3/4 x 16½x7-3/4	5½ x 18 x 8-2/3	5 x 22 x 7-3/4	13 x 3½ x 9	17½x5x 8-2/3	14½ x 4 x 10-1/2	4-3/4 x 12 x 7-1/3	4-2/3 x 19 x 11	24-3/4 x 7½ x 11
Approx. delivery time, weeks ###	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

** Dry cycle.
* Depending on type of injection.
\# Cubic inches.
Cubic inches per second.

\# Cubic inches/min.
During rapid advance.
During final fill.
* on 20,000 psi.
** Idling.

Manufacturer*	Lombard					Moslo ##			
Machine model	2414-6	3214-12	3220-125	3624-18	300-145	Duplimatic Model 11	Duplimatic Model 12	1-12-85†	3-12-85†
Machine action	Automatic, Semi-automatic, or Manual.					Manual, Semi-auto.,		Manual, semi-auto., auto.	
Machine type	Horizontal.					Vertical	Vertical	Horiz.	Horiz.
Clamping mechanism	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle
Injection capacity, oz./shot	6 - 9	12 - 16	12 - 16	18 - 24	14	3	4 - 6	1**	3
Casting area, sq. in. **	110	165	165	225	- - -	20	40	42.5	42.5
Injection plunger: Stroke, in.	10	12	12	12½	12	8	8	3	6½
Plunger speed, in./min.	430##; 226###	320##; 156###	410##; 202,151###	408##; 151###	230 adj.	4½*	9.36*	6.8*	8.13*
Pressure on material, psi.	20,000	20,000	20,000	20,000	19,000**	17,550	20,000	23,790	17,100
Injection rate, lbs./hr.	#1,710##; 900###	2,260##; 1,110###	1,440##; 940###	3,920##; 1,450###	1,200	60	- - -	- - -	- - -
Plasticizing capacity, lbs./hr.***	150	150	150	200	120	60	80	80	60
Cycles/hour	900*	520*	700,560*	425*	- - -	490	690	2,170	113
Mold: Size, inches	14-7/8x28	20 x 36	32 x 32	23-3/4x38	16½x28	6 x 8, 6 x 17	7-7/8x10, 7-7/8x23½	11 x 16	11 x 16
Daylight opening, in.	32	36	42	50	32	2½	5	12	12
Thickness (min.-max.), in. ****	6 - 18	8 - 22	8 - 22	8 - 26	6 - 18	- - -	- - -	12	12
Locking force, tons	250	325	375	450 max.	300	75	90	85	85
Clamping stroke (min.-max.), in.	6 - 14	8 - 14	8½ - 20	8 - 24	6 - 14	- - -	- - -	5-12 adj.	5-12 adj.
Clamp tie bars or rods: Diameter, in.	3½	4	4	4½	- - -	None	None	2	2
Space between (W x H), in.	15 x 15	20½ x 20½	20½ x 20½	23-7/8 x 21-7/8	14-3/4 x 15	- - -	- - -	9½x11-1/8	9½x11-1/8
Hopper capacity, lbs.	100	100	100	100	- - -	75	75	75	75
Cylinder heating capacity, kilowatts	24.8	24.8	24.8	32.3	12.2	6.3	7.3	9.6	7.2
Motor horsepower	25	30	50	50	25	5	15	12½	10
Oil tank or reservoir capacity, gals.	100	150	150	150	- - -	90	80	95	95
Special features (at no extra cost)	Stuffing arrangement.								
	L-p die closing.	Hydr. positioning of injection & linkage units. Hi-speed plunger prefill. Dual injection pressure controls.			Screw inj. molding machine.	Vibration pads.	Hyd. retraction of inj., 2-hand safety.	Adjustable toggle clamp.	
		Unbreakable heater.	Hi-speed units.						
Optional features (at added cost)	L-p mold closing. Pre-compressed molding. Hi-speed injection unit. Mold stop & slow-down control. Core pulling attachment.					Low-pressure clamp closing.			
							Second injection pressure.		
	M20 & M30 2nd stage injection units.	"Impulse" molding unit. M32 & M50 2nd stage inj. units.		Weigh-feed. Nylon shut-off valve. Impulse molding unit. M50 2nd stage injection unit.					
Machine dimensions, (W x D x H), feet	17½x3-3/4 x 7	17½ x 4 x 7	19½ x 4 x 8	22x4-3/4 x 7	17x3-3/4 x 7	2½x6-2/3 x 7	4 x 7½ x 7-1/6	14½ x 3 x 6½	14½ x 3 x 6½
Approximate delivery time, weeks ###	- - -	2	2	- - -	- - -	3 - 4	4 - 6	3 - 4	3 - 4

Cu. in./min. during prefill or approach.
Cu. in./min. while injecting.
* Dry cycle.
** Cubic inches/min.

* Cubic inches per second.
** Without prepack.

Manufacturer*	Moslo ## (Cont'd.)		Natco					Newbury ##	
Machine model	46-12-200†	68-12-200†	300-E	400-E	600-E	800-E	1,200-E	Imperial	Auto-Hornet
Machine action	Auto., semi, manual		Semi-automatic.					Auto.	Auto.
Machine type	Horizontal.		Horizontal.					Horiz.	Horiz.
Clamping mechanism	Toggle	Toggle	Hydraulic.					Toggle	Toggle
Injection capacity, oz./shot	4 - 6	6 - 8	35	60	60	140	140	2	1½
Casting area, sq. in.**	100	100	Depends on part design & plastic material used.					20	9
Injection plunger: Stroke, in.	8	8	10½	10-3/4	10-3/4	14	14	8	8
Plunger speed, in./min.	12.2*	11.3*	- - -	- - -	- - -	- - -	- - -	3½*	5½*
Pressure on material, psi.	18,000	19,300	17,800	17,800	17,800	17,600	17,600	12,000-17,800	4,000-30,000
Injection rate, lbs./hr.	- - -	- - -	21#	21 or 44	38 or 76	39 or 78	78	- - -	- - -
Plasticizing capacity, lbs./hr. ***	100	100	220	330	330	600	600	25-30	10½
Cycles per hour	840	666	Estimated cycle time furnished upon receipt of plastic part specification.					600	500
Mold: Size, inches	14-7/8 x 22-1/2		33 x 21½	38x24-3/4	48 x 31	55x36½	65x44½	9-7/8x8	6 x 5-1/8
Daylight opening, in.	15	15	42½ max.	62 max.	70 max.	85 max.	100 max.	5-7/8	4-7/8
Thickness (min.-max.) in.****	15	15	8 - 18½	12 - 36	10 - 35	15 - 45	15 - 50	8½	5
Locking force, tons	200	200	325	425	650	650	1,200	42	18
Clamping stroke (min.-max.) in.	5-12 adj.	5-12 adj.	24	24 or 36	35 or 45	40 or 55	50	6	5
Clamp tie bars or rods: Diameter, in.	3	3	4½	5	6½	7	8½	1-3/4	1-1/4
Space between (W x H), in.	13-3/4 x 15-3/8		21½x21½	25 x 25	31½ x 31½	36½ x 36½	44½ x 44½	8½ x 6½	5-3/4 x 5-3/4
Hopper capacity, lbs.	75	75	200	200	200	300	300	25	620**
Cylinder heating capacity, kilowatts	9.6	10.8	14##	18##	18	47	47	2.4	0.95
Motor horsepower	20	20	87½	147½ max.	217½ max.	257½ max.	257½ max.	5	2
Oil tank reservoir capacity, gals.	95	95	175	260	500	500	1,000	25	8
Special features (at no extra cost)	Injection prepack. Adj. toggle clamp.		Recip. screw type preplasticiser, adj. 2-speed, 2-press. inj., reversing pump for shockless system.					- - -	- - -
Optional features (at added cost)	L-p clamp closing. Sec. inj. press. Precompression.		Auto. cycle control, longer clamp stroke, extruder screw for PVC molding.					- - -	- - -
Machine dimensions (W x D x H), ft.	14 x 3 x 6½	15½ x 3 x 6½	- - -	- - -	- - -	- - -	- - -	8x3x6	2 x 4½ x 7½
Approx. delivery time, weeks ###	4 - 6	4 - 6	Built in stock quantities for prompt deliveries.					6	3 - 5

(Same as above)

\# Cubic inches per second.
Extruder barrel heat.

* Inches per second.
** Cubic inches.

Manufacturer*	Newbury ** (Cont'd.)				Reed-Prentice **					
Machine model	Super Hornet	Super Standard	Kildorado 70VC110	Wasp Model 50	175T-4/6	Jetflo	275T-8/10	320TC-12/16	450T-22/30	600T-32/48
Machine action	Manual	Semi-auto.	Auto.	Manual	Auto.	Auto.	Semi-automatic.			
Machine type	Horiz.	Vert.	Vert.	Vert.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.
Clamping mechanism	Toggle	Toggle	Toggle	Wedge	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle
Injection capacity, oz./shot	3/4	1½	1½	3/4	4 - 6	6	8 - 10	12 - 16	22 - 30	32 - 48
Casting area, sq. in. **	6	9	9	6	75	75	138	178	240	300
Injection plunger stroke, in.	6	8	8	6	8-7/8	6	11	11-5/8	14½	10
Plunger speed, in./min.	- - -	- - -	3*	- - -	155	360	179	170	138	59.6
Pressure on material, psi.	6,000-30,000	4,000-30,000	4,000-30,000	6,000-30,000	17,800	17,000	20,000	19,700	20,100	19,350
Injection rate, lbs./hr.	- - -	- - -	- - -	- - -	492#	1,160#	968#	1,360#	1,560#	1,450#
Plasticizing capacity, lbs./hr.***	10½	10½	10½	5½	75	100	120	150	200	180
Cycles/hour	- - -	360	500	- - -	630	1,242	567	535	354	172
Mold: Size, in.	6 x 5	6 x 5-1/8	2-5/8x6	2-5/8x6	22x13½	22x13½	16½x27½	32½x20½	40 x 26	54 x 30½
Daylight opening, in.	3	4-7/8	4-7/8	- - -	22	22	27-3/4	36½	47-1/8	56
Thickness (min.-max.) in.****	- - -	5	5	- - -	14	14	16½	22	24½	32
Locking force, tons	12	18	18	- - -	175	175	275	356	480	600
Clamping stroke (min.-max.), in.	3½	5	5	- - -	5 - 8	5 - 8	6½ - 11½	7½ - 14½	6 - 22-5/8	24 max.
Clamp tie bars or rods: Diameter, in.	1	"C"-Frame	"C"-Frame	Wedge	3	3	3½	4	5	6
Space between (V x H), in.	4-3/4 x 4-3/4	- - -	- - -	- - -	13½x13½	13½x13½	16½x16½	20½x20½	26x26	30½x26½
Hopper capacity, lbs.	4	220**	620**	4	100	100	150	190	150	190
Cylinder heating capacity, kilowatts	0.95	0.95	0.95	0.55	13.6	15.4	15.88	25.3	33.61	24.1
Motor horsepower	2	2	2	1	15	40	30	40	50	50
Oil tank or reservoir capacity, gals.	3	8	8	3	80	100	155	155	150	200
Special features (at no extra cost)	- - -	- - -	- - -	- - -	2-stage injec., built-in stuffing.	Ip die closing.	Two-stage injection. Built-in stuffing.			
Optional features (at added cost)	- - -	- - -	- - -	- - -	Ip die closing. Larger heating cyl. Long stroke up to 12".	Nylon molding provision.	Larger heating cyl. 50 hp. motor. Ip die closing. Long stroke up to 20½".		Nylon molding equip.	60 hp. motor. Power pack units.
Machine dimensions (W x D x H), feet	3x1½ x 2	2 x 5 x 5	2 x 5 x 5½	3 x 1½ x 6	15-3/4 x 2-3/4 x 6-2/3	18x5-1/3x 5-2/3	18-2/3x5½x 7½	19x5-2/3x 7	23x5-2/3x 7½	25x6½x7½
Approximate delivery time, weeks ###	2 - 3	2 - 3	3 - 5	2 - 3	4	8	4	3 - 4	5 - 6	9 - 12

* Inches/second. ** Cubic inches.

Displacement rate, cu. in./min.

Manufacturer*	Simplo matic	Standard Tool						Stokes		
Machine model	PRO-1-57 Little Giant	SA-20-100T	K2-100-50	K2-C-50-50	K2-E-50-50	K3-100-50	K36-100-50	701	703	706
Machine action	Manual or Auto.	Automatic, semi-automatic, manual.						Auto.	Auto.	Auto.
Machine type	Vert.	Horizontal.						Vertical clamp.		Horiz.
Clamping mechanism	Pneumatic	Hydraulic.						Toggle	Toggle	Toggle
Injection capacity, oz./shot	1/3	2	2	2	2	3	6	2	6	12
Casting area, sq. in.**	6	60	60	35	35	100	100	20	100	- - -
Injection plunger: Stroke, in.	2½	4	4	5	5	6	4	4½	9	5
Plunger speed, in./min.	- - -	6.5*	6.5*	6.5*	6.5*	6.5*	6.5*	200	260	875*
Pressure on material, psi.	7,000	14,000-29,000	14,000-29,000	14,000-20,000	14,000-20,000	14,000-20,000	27,500	12,100	19,600	20,600
Injection rate, lbs./hr.	6*	390**	390**	390**	390**	390**	390**	40	90	- - -
Plasticizing capacity, lbs./hr.***	6	30;40	30;40	30;40	30;40	4 - 5	60	45	90	100
Cycles per hour	50-900**	1,500; 2,000#	1,500; 2,000#	2,000#	2,000#	1,500#	1,200#	1,030	495	450
Mold: Size, in.	3½ x 5½	9 x 12	9 x 12	9 x 12	9 x 12	12 x 15	12 x 15	16 x 8½	23½ x 16	23½ x 16
Daylight opening, in.	2½	12-3/4-18	12-3/4-18	12-3/4##	12-3/4##	18##	18##	14 - 20½	26 - 34	26 - 34
Thickness (min.-max.), in.****	2½	6 - 9	6 - 9	6***	6***	9***	9***	8½ - 15	28½ - 36½	26 - 34
Locking force, tons	3½	100	100	50	50	100	100	50	250	300
Clamping stroke (min.-max.), in.	- - -	0 - 9	0 - 9	0 - 6-3/4	0 - 6-3/4	0 - 9	0 - 9	5½	12	12
Clamp tie bars or rods: Diameter, in.	- - -	Solid weldment.						1 - 3/4	4½	4½
Space between (V x H), in.	- - -	9-3/8x12	9-3/8x12	9-3/8x12	9-3/8x12	12-3/8x15	12-3/8x15	(17-3/4 x (6-3/4	24 x 10	24 x 10
Hopper capacity, lbs.	5	125	125	125	125	125	100	30	85	150
Cylinder heating capacity, kilowatts	0.65	3.15,6.8	3.15,6.8	3.15,6.8	3.15,6.8	6.8	9.0	5.4	17.3	18
Motor horsepower	- - -	20	20	15	10	20	20	7½	20	40
Oil tank or reservoir capacity, gals.	- - -	60	60	50	50	50	50	70	150	135
Special features (at no extra cost)	Operates on 100-125 psi.air line press; Auto.nozzle shut-off valve.	Sep.hydr. drive can run 1-3 machines.		Sep.hydr. drive can run 1-3 machines.			Screw-type injection.	Injection nozzle shut-off. Prepack. Positive ejection.		
Optional features (at added cost)	Higher cycling speeds; Nozzle orifices to order.	Prepack. Ip closing, heat control for hot-runner molds. Airsweep unit for auxiliary injection, extension nozzles.						None required.		
Machine dimensions (W x D x H), ft.	2½x1½x 4-2/3	3x8x6, 3x10x6	3x8x6, 3x10x6	4x8x6	3x8x6	3x10x6	3x11x6	3½x7x 8½	4½x12x 11½	4½x13x 11½
Approx. delivery time, weeks ###	2 - 3	- - -	- - -	- - -	- - -	- - -	- - -	3 - 4 Average.		

* Plasticizing capacity. **Dry cycles. #At 125 psi.line pressure.

**Cubic inches per second. *Inches per second. #Dry cycle. ##Maximum. ###Minimum.

*Cubic inches per minute.

Van Dorn

Manufacturer* / Machine model	H-200	H-250	H-260	H-270	H-300A	H-400B
Machine action	Semi-auto.	Auto.	Auto.	Auto.	Auto.	Auto.
Machine type	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.
Clamping mechanism	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle
Injection capacity, oz./shot	2	2	2	2	3	4
Casting area, sq. in. **	- - -	- - -	- - -	- - -	- - -	- - -
Injection plunger stroke, in.	7	7	7	8	7	10
Plunger speed, in./min.	225	270	270	405	300	175##
Pressure on material, psi.	10,000	12,000	12,000	17,100-21,600	20,000	20,000
Injection rate, lbs./hr.	12	22	30	- - -	60	80
Plasticizing capacity, lbs./hr.***	12	22 plus	30 plus	35	60	80
Cycles/hour	480-600	720 max.	720 max.*	900*	1,100max.*	800 max.*
Mold: Size, in.	9x12 max.	9x12 max.	9x12 max.	10 x 14	12x18 max.	13-3/8 x 23½ max.
Daylight opening, in.	6	6	6	17½	4-8;4-12	- - -
Thickness (min.-max.), in.****	3 x 8½	3 x 8½	3 x 8½	5 x 10	4-12;6-14	6 - 16
Locking force, tons	30	30	30	55	100	200
Clamping stroke (min.-max.), in.	6#	6#	6#	7½	4 - 8#	4 - 10#
Clamp tie bars or rods: Diameter, in.	1 - 3/4	1 - 3/4	1 - 3/4	1 - 3/4	2 - 1/4	2 - 3/4
Space between (V x H), in.	9	9	9	8-1/8 x 10-1/8	12-1/8 x 10-1/8	13-1/2 x 12-1/8
Hopper capacity, lbs.	6	40	40	50	50	50
Cylinder heating capacity, kilowatts	1.68	2.6	3.135	4.0	- - -	- - -
Motor horsepower	5	7½	7½	7½	15	20
Oil tank or reservoir capacity, gals.	20	20	40	40	60	80
Special features	Automatic part ejector. Adjustable material metering. Oversize heater. Adjusts to varying mold thicknesses.					
		L/p clamping.	Extended nozzle.		Repeat cycle timer. 8" stroke.	Double toggle lock. Stuffing arrangement.
Optional features (at added cost)	Can mold vinyls.					
Machine dimensions (W x D x H), feet	- - -	- - -	- - -	- - -	- - -	- - -
Approximate delivery time, weeks ###	4 - 6	4 - 6	4 - 6	3 - 5	4 - 6	4 - 6

Not adjustable. ## Adjustable. * Dry cycle.

Watson-Stillman

Manufacturer* / Machine model	H-5/8-215	H-12/20-350	H-24/32-425	H-32/42-650
Machine action	Semi-automatic.			
Machine type	Horiz.	Horiz.	Horiz.	Horiz.
Clamping mechanism	Hydr.	Hydr.	Hydr.	Hydr.
Injection capacity, oz./shot	6 - 8	12 - 20	24 - 32	32 - 42
Casting area, sq. in. **	- - -	- - -	- - -	- - -
Injection plunger stroke, in.	9	15	14½	14½
Plunger speed, in./min.	310	169	175	130
Pressure on material, psi.	20,000	20,000	20,000	20,000
Injection rate, lbs./hr.	1,160*	1,290*	1,800*	1,800*
Plasticizing capacity, lbs./hr.***	90	150	250	335
Cycles/hour	- - -	- - -	- - -	- - -
Mold: Size, in.	15-3/4 x 25½, 25½ x 15-3/4	20½x36, 36x20½	27 x 45, 40½x25	30½ x 48, 48 x 30½
Daylight opening, in.	30	45	40	54
Thickness (min.-max.), in.****	12 - 18	8	8 - 16	12 - 24
Locking force, tons	215	350	425	650
Clamping stroke (min.-max.), in.	12	24	24	30
Clamp tie bars or rods: Diameter, in.	3 - 3/4	5	4 - 3/4	6
Space between (V x H), in.	15-3/4 x 15-3/4	20½x20½	27 x 25	30½ x 30½
Hopper capacity, lbs.	- - -	- - -	- - -	- - -
Cylinder heating capacity, kilowatts	10	20½	24½	29
Motor horsepower	50	55	70	70
Oil tank or reservoir capacity, gals.	- - -	- - -	- - -	- - -
Special features	Inj. plunger prepositioned for shorter travel; stuffing box increases shot capacity.			
Optional features (at added cost)	L/p mold protection, automatic cycle timer, weigh feeder, plunger & screw preplasticizers, booster for hi-speed inj., nylon nozzle attachments.			
Machine dimensions (W x D x H), feet	5½x15x6½	6½x19½x9	6½x21x8½	8x27x9
Approximate delivery time, weeks ###	2 - 4	6 - 8	2 - 12	10 - 12

* Cubic inches/minute.

Watson-Stillman (Cont'd.)

Manufacturer* / Machine model	H-48/64-1000	H-80/100-1500
Machine action	Semi-automatic	
Machine type	Horiz.	Horiz.
Clamping mechanism	Hydr.	Hydr.
Injection capacity, oz./shot	48 - 64	80 - 100
Casting area, sq. in. **	- - -	- - -
Injection plunger: Stroke, in.	18½	18½
Plunger speed, in./min.	200	200
Pressure on material, psi.	21,000	20,000
Injection rate, lbs./hr.	3,350*	3,500*
Plasticizing capacity, lbs./hr. ***	500	600
Cycles per hour	- - -	- - -
Mold: Size, inches	40x60, 60x40	48x72, 72x48
Daylight opening, in.	66	72
Thickness (min.-max.), in.****	12 - 30	12 - 30
Locking force, tons	1,000	1,500
Clamping stroke (min.-max.), in.	36	48
Clamp tie bars or rods: Diameter, in.	7½	10
Space between (V x H), in.	40 x 40	48 x 48
Hopper capacity, lbs.	- - -	- - -
Cylinder heating capacity, kilowatts	52½	52½
Motor horsepower	135	135
Oil tank or reservoir capacity, gals.	- - -	- - -
Special features (included at no extra cost)	(Same as above.)	
Optional features (at added cost)	(Same as above.)	
Machine dimensions (W x D x H), ft.	7x32½x 11	8x42x 14
Approx. delivery time, weeks ###	16 - 18	16 - 18

* Cubic in./min.

Windsor

Manufacturer* / Machine model	SP7	SP29	AP30/115	AP130	AP200	AP335
Machine action	Auto.	Auto.	Manual, Semi-auto.	Auto.	Auto.	Auto.
Machine type	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.
Clamping mechanism	Toggle	Toggle	Toggle	Toggle	Toggle	Toggle
Injection capacity, oz./shot	1/4	1-1/8	4.4	5	7.7	13.1
Casting area, sq. in. **	40*	160*	350*	450*	- - -	- - -
Injection plunger: Stroke, in.	- - -	- - -	- - -	36	17	17
Plunger speed, in./min.	288.3	- - -	- - -	- - -	325	315
Pressure on material, psi.	17,000	12,500	10,000	10,000	12,500	12,500
Injection rate, lbs./hr.	- - -	- - -	- - -	- - -	- - -	- - -
Plasticizing capacity, lbs./hr. ***	40#	100#	250-300	250-300	350	420
Cycles per hour	4,327	2,400	1,200	900	1,200	1,107
Mold: Size, inches	21 x 21	29½x25	41 x 43	51 x 51	51 x 51	70 x 62
Daylight opening, in.	10	12	32	36 - 68	68	86
Thickness (min.-max.), in.****	14	17	26	32	32	44
Locking force, tons	80	300	600	800	800	1,150
Clamping stroke (min.-max.), in.	- - -	- - -	- - -	- - -	- - -	- - -
Clamp tie bars or rods: Diameter, in.	2½	3½	6	6½	6½	- - -
Space between (V x H), in.	15 x 15	25 x 29½	23-3/4 x 25-3/4	33½x33½	40 x 40	48½ x 40½
Hopper capacity, lbs.	35	80	140	- - -	- - -	480
Cylinder heating capacity, kilowatts	5	11	11	16½	36	53½
Motor horsepower	15 & 6½	25	50	50	50	150
Oil tank or reservoir capacity, gals.	- - -	- - -	- - -	- - -	- - -	- - -
Special features (included at no extra cost)	Single-screw in-line preplasticizer with adj. screw pressure; auto.nozzle shut-off valve; removable upper tie bars to handle larger molds.		Twin-screw preplasticizer for stress-free moldings.	Twin-screw "Autoplas" 2-stage inj. unit; hyd. mold height adj.; constant-stroke clamping unit.		
Optional features (at added cost)	Screw & barrel assemblies to order, also interchangeable inj. heads.					
Machine dimensions (W x D x H), ft.	16x3½x 6	19½x5½x 8-1/3	25x6-3/4x 8½	24-2/3x 5-1/3x--	28 x 5-1/3 x --	33x6-2/3x --
Approx. delivery time, weeks ###	- - -	- - -	- - -	- - -	- - -	- - -

* Projected.
# Based on continuous rating of preplasticizer.
** Without hopper.

PT's classified list of auxiliary equipment for injection molding

Blenders

Abbe Engineering Co., 420C Lexington Avenue, New York 17, N.Y.
Paul O. Abbe, Inc., 257 Center Avenue, Little Falls, New Jersey
Acme Machinery & Mfg. Co. Inc., 500 Saw Mill River Rd., Yonkers 2, New York
Blaw-Knox, 300 Sixth Avenue, Pittsburgh 22, Pennsylvania
The Bonnot Co., 722 Mulberry Avenue, S.E., Canton 2, Ohio
Arthur Colton Co., Div. of Snyder Corp., 3400 E. Lafayette St., Detroit 7, Mich.
Crown Machinery Inc., 2721 S. San Pedro St., Los Angeles 11, Calif.
J. H. Day Co., Div. of Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
J. P. Devine Mfg. Co., 49th St. & A.V.R.R., Pittsburgh 1, Pa.
Entoleter Div., Safety Industries, Inc., 1187 Dixwell Ave., New Haven, Conn.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Ferro Corp., Patterson Equipment Div., E. Liverpool, Ohio
First Machinery Corp., 209-289—10th Street, Brooklyn 15, New York
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Lupoline Automatic Polishing Equipment Corp., 4510 Bullard Ave., Bronx 70, N.Y.
Manton-Gaulin Mfg. Co., Inc., 44 Garden Street, Everett 49, Mass.
Mitchell Specialty Div., Industrial Enterprises, Inc., Edmund & Shelmire Sts., Phila. 36, Penna.
Munson Mill Machinery Co., 210 Seward Ave., Utica 1, New York
Patterson Foundry and Machine Co., 1250 St. George St., E. Liverpool, Ohio
Patterson-Kelley Co. Inc., E. Stroudsburg, Pa.
Plastic Molders Supply Co., Inc., 74 South Avenue, Fanwood, N.J.
Prodex Corp., King George Road, Fords, N.J.
Rainco Mfg., Inc., R.D. #2, Franklin, Pa.
The Rainville Co., Inc., 839 Stewart Avenue, Garden City, New York
Read Standard, Div. of Capitol Products Corp., 901 S. Richland Ave., York, Pa.
Reliable Rubber & Plastic Machinery Co., Inc., 2014 Union Turnpike, No. Bergen, N.J.
Charles Ross & Son Co., 148 Classon Ave., Brooklyn 5, N.Y.
Sprout, Waldron & Co., Inc., 130 Logan Street, Muncy, Pa.
The Strong-Scott Mfg. Co., 451 Taft St. N.E., Minneapolis 13, Minn.
Sturtevant Mill Co., 103 Clayton Street, Boston, Mass.
Tower Iron Works, Inc., 50 Borden Street, Providence, R.I.
Young Machinery Co., Inc., R.D. #2, Muncy, Pa.

Conveyors

Abbott Plastic Machine Corp., 7124 N. Clark St., Chicago 26, Ill.
E. B. Blue Co., 651 Connecticut Ave., S. Norwalk, Conn.
Brady Conveyors Corp., 4244 Dempster St., Skokie, Ill.
Carpco Mfg., Inc., 4120 Haines St., Jacksonville 6, Fla.
D. C. Cooper Co., 1467 S. Michigan Ave., Chicago 5, Ill.
The J. H. Day Co., Div. of Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, O.
Dean Panel Coil, Dean Products, Inc., 1048 Dean St., Brooklyn 38, N.Y.
Dracco Div. of Fuller Co., 4063 E. 116th St., Cleveland 5, Ohio
Vern Emery Co., 10647 Wixom St., Sun Valley, Calif.
The Falls Engineering & Machine Co., 1734 Front St., Cuyahoga Falls, Ohio
Ferry Machine Co., W. Main Street Extension, Kent, Ohio
Herbert Products, Inc., 74-32 Jamaica Ave., Woodhaven 11, New York
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Indiana Commercial Filter Corp., Lebanon, Ind.
Jennings Engineering Co., 3444 Ludlow St., Philadelphia 4, Pa.
Karlton Machinery Corp., 210 E. Ohio St., Chicago 11, Ill. (Rep. for Becker & Van Hullen)
L & P Tool Co., 2861 Sidney Ave., Cincinnati 25, Ohio
Leon Machine & Engineering Co., 61 Whittaker St., Riverside, N.J.
Magnetic Engineering & Mfg. Co., 851 Van Houten Ave., Clifton, N.J.
Mercury Heat Sealing Equipment Co., 2601-21 N. Howard St., Philadelphia 33, Pa.
Mitchell Specialty Div., Industrial Enterprises, Inc., Edmund & Shelmire Sts., Phila. 36, Pa.
Modern Plastic Machinery Corp., 64 Lakeview Avenue, Clifton, N.J.
Motch & Merryweather Machinery Co., 1258 E. 222nd St., Cleveland 17, Ohio
National Rubber Machinery Co., 47 W. Exchange St., Akron 8, Ohio
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
Plastic Fabricants, Div. of The Woodman Co., Inc., 647 E. College Ave., Decatur, Ga.
Prodex Corp., King George Road, Fords, New Jersey
Pulverizing Machinery Div., Metals Disintegrating Co., Inc., 30 Chatham Rd., Summit, N.J.
Robinson Air-Activated Conveyor Systems, 80 Fifth Avenue, New York 11, N.Y.
Spencer Turbine Co., 486 New Park Ave., Hartford 6, Conn.
Sprout, Waldron & Co., Inc., 130 Logan Street, Muncy, Pa.
Syntron Co., P.O. Box 2200, Homer City, Pa.
Tote System, Inc., 710 S. Seventh, Beatrice, Neb.
Union Tool Corp., 900 N. Detroit st., Warsaw, Ind.
John Verduin Machine Corp., 345-347 Tenth Avenue, Paterson 4, N.J.
Waldron-Hartig Div., Midland Ross Corp., P.O. Box 791, River Rd., New Brunswick, N.J.
L. R. Wallace & Co., 172 N. Vernon Ave., Pasadena 1, Calif.
Douglas C. Whitaker Co., Box 271, Glenside, Pa.
Whitlock Associates, Inc., 21655 Coolidge Highway, Oak Park 37, Mich.
Wilkinson Co., 619 E. Tallmadge Ave., Akron 10, Ohio
Young Machinery Co., Inc., R.D. #2, Muncy, Pa.

Deflashing Machines

Anson Tools & Gages, Inc., 1504 W. 12th Street, Erie, Pa.
Buttondex Corp., 386 Fourth Avenue, New York 16, New York
Falls Engineering & Machine Co., 1734 Front St., Cuyahoga Falls, Ohio
Ferry Machine Co., W. Main Street Extension, Kent, Ohio
Foredom Electric Co., Inc., Bethel, Conn.
Gaynes Engineering Co., 1642 W. Fulton St., Chicago 12, Ill.
Ketchpel Engineering Co., 1401-04 Palisade Avenue, W. Englewood, N.J.
H. W. Kramer Co., Inc., 120-30 Jamaica Ave., Richmond Hill 18, N.Y.
Lord Chemical Corp., 2068 S. Queen Street, York, Pa.
Lupoline Automatic Polishing Equipment Corp., 4510 Bullard Ave., Bronx 70, N.Y.
Merit Products, Inc., 3691 Lenawee Ave., Los Angeles 16, Calif.
J. M. Nash Co., Inc., 2360 N. 30th Street, Milwaukee 45, Wis.
Ransohoff Co., North 5th St. & Ford Blvd., Hamilton, Ohio
The R. R. Siebert Co., 183 St. Paul St., Rochester, N.Y.
Techline Div., Wheelabrator Corp., 1414 Avenue V, Vicksburg, Mich.
Tumb-L-Matic, Inc., St. Mary's Street, Stamford, Conn.
Wheelabrator Corp., 1414 S. Byrkit St., Mishawaka, Indiana

Degating Equipment

Anson Tools & Gages, Inc., 1504 W. 12th Street, Erie, Pa.
Atlas Machine & Tool Corp., 259 Hackensack St., East Rutherford, N.Y.
Barker-Davis Machine Co., Inc., 91 Mechanic St., Leominster, Mass.
Buss Machine Works, Inc., 300 Eighth St., Holland, Mich.
Buttondex Corp., 386 Fourth Avenue, New York 16, N.Y.
Injection Molders Supply Co., 17601 So. Miles Rd., Cleveland 28, Ohio
C. A. Lawton Co., 233 No. Broadway, De-Pere 1, Wisconsin
Plastic Molders Supply Co., Inc., 74 South Ave., Fanwood, N.J.
Standard Tool Co., 203 Hamilton St., Leominster, Mass.
Sta-Warm Electric Co., 858 N. Chestnut St., Ravena, Ohio
Stricker-Brunhuber Corp., 19 W. 24 St., New York 10, N.Y.
Wheelabrator Corp., Techline Div., 1414 Avenue V, Vicksburg, Mich.

Dicers & Choppers

Abbe Engineering Co., 420 C Lexington Avenue, New York 17, N.Y.
Acme Machinery & Mfg. Co., Inc., 500 San Mill River Rd. Yonkers 2, N.Y.
Alsteele Engineering Works, Inc., 82 Herbert St., Framingham, Mass.
American Pulverizer Co., 1249 Macklind Ave., St. Louis 10, Mo.
Atlas-Sandt Corp., 240-42 W. 23 St., New York 11, New York
Ball & Jewell, Inc., 24-28 Franklin St., Brooklyn 22, N.Y.
Blaw-Knox Co., 300 Sixth Avenue, Pittsburgh 22, Pa.
Brosites Machine Co., Inc., 50 Church St., New York 7, N.Y.
Carbert Mfg. Co., Inc., 143 Sidney St., Cambridge 39, Mass.
Arthur Colton Co., Div. of Snyder Corp., 3400 E. Lafayette St., Detroit 7, Mich.
Continental Machinery Co., Inc., 261 Broadway, New York 7, N.Y.
Cumberland Engineering Co., Inc., P.O. Box 216, Providence, R.I.
Custom Machine & Design, Inc., P.O. Box 1064, 200 S. Forge St., Akron 9, Ohio
DeMattia Machine & Tool Co., Brighton & Chelsea Rd., Clifton, N.J.
Ferry Machine Co., W. Main St. Extension, Kent, Ohio
Foster & Allen, Inc., 26 Commerce St., Chatham, N.J.
Getty Machine & Mold, Inc., 384 Getty Ave., Clifton, N.J.
Hale & Kullgren Plastics Dept., Aetna-Standard Div., Blaw-Knox Co., P.O. Box 1231, Akron 9, Ohio
Hobbs Mfg. Co., 26 Salisbury St., Worcester 5, Mass.
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Johnson Machinery Co., 90 Elizabeth Ave., Elizabeth, N. J.
Mitts & Merrill, 1016 S. Water St., Saginaw, Michigan
Franklin P. Miller & Son, 36 Meadow St., E. Orange 16, N.J.

Modern Plastic Machinery Corp., 64 Lakeview Ave., Clifton, N.J.
Motch & Merryweather Machinery Co., 1258 E. 222nd St., Cleveland 17, Ohio
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
The Rainville Co., Inc., 839 Stewart Ave., Garden City, New York
Spadone Machine Co., Inc., Connecticut Avenue, S. Norwalk, Conn.
Sprout, Waldron & Co., Inc., 130 Logan St., Muncy, Pa.
Taylor Stiles & Co., 13 Bridge St., Riegelsville, N.J.
Thoreson-McCosh, Inc., 18208 McNichols Rd., Detroit 19, Mich.
The Van Dorn Iron Works Co., 2685 East 79th St., Cleveland, Ohio

Dryers, Non-Oven

Paul O. Abbe, Inc., 257 Center Ave., Little Falls, N.J.
Ball & Jewell, Inc., 24-28 Franklin St., Brooklyn 22, N.Y.
The Black-Clawson Co., Dilts Div., 46 N. First St., Fulton, New York
Blaw-Knox Co., 300 Sixth Avenue, Pittsburgh 22, Pa.
E. B. Blue Co., 651 Connecticut Avenue, S. Norwalk, Conn.
Carpco Mfg. Inc., 4120 Haines St., Jacksonville 6, Florida
Continental Machinery Co., Inc., 261 Broadway, New York 7, New York
F. C. Dawson Engineering Co., 641 Washington St., Canton, Mass.
Dean Panel Coil, Dean Products, Inc., 1048 Dean St., Brooklyn 38, N.Y.
The DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio
J. P. Devine Mfg. Co., 49th St. & A.V.R.R., Pittsburgh 1, Pa.
J. E. Doyle Co., 1220 W. Sixth St., Cleveland 13, Ohio
Dryomatic Corp., 806 N. Fairfax St., Alexandria, Va.
Falcon Equipment Co., 13th St., New Brighton, Pa.
The Fostoria Pressed Steel Corp., 1200 N. Main St., Fostoria, Ohio
General Research & Supply Co., 572 S. Division Ave., Grand Rapids 3, Mich.
Girdler Process Equipment Div., Chemetron Corp., 334 E. Broadway, Louisville 1, Ky.
Glenn Electric Heater Corp., 372 Jelliff Ave., Newark 8, N.J.
Goulding Mfg. Co., 2929 River St., Saginaw, Michigan
Guild Electronics, Inc., Dynatherm Div., 388 Broadway, New York 13, N.Y.
Herbert Products, Inc., 74-32 Jamaica Ave., Woodhaven 11, New York
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Infra-Red Systems Inc., 240 Route 23, Riverdale, N.J.
Johnson Mfg. Co., Inc., Highway 178, Chippewa Falls, Wis.
C. A. Litzler Co., Inc., 235 Brookpark Rd., Cleveland 9, Ohio
Lydon Bros., Inc., 85 Zabriskie St., Hackensack, N.J.
Miskella Infra-Red Co., Inc., E. 73rd & Grand Ave., Cleveland 4, Ohio
Mitchell Specialty Div., Industrial Enterprises, Inc., Edmund & Shelmire Sts., Phila. 36, Pa.
Monkley Corp., 42 Lagrange St., Worcester 8, Mass.
Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio
Omni Products Corp., 460 Fourth Avenue, New York 16, New York
Patterson Foundry and Machine, 1250 St. George St., E. Liverpool, Ohio
The Patterson-Kelley Co., Inc., E. Stroudsburg, Pa.
Proctor & Schwartz, Inc., 7th St. & Tabor Rd., Philadelphia 20, Pa.
The Rainville Co., Inc., 839 Stewart Ave., Garden City, New York
Sta-Warm Electric Co., 858 N. Chestnut St., Ravenna, Ohio
F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa.
Thermomat Co. Inc., 623 Prospect St., Trenton 8, N.J.
Thoreson-McCosh, Inc., 18208 McNichols Rd., Detroit 19, Mich.
Tower Iron Works, Inc., 50 Borden St., Providence, R.I.
Universal Dynamics Corp., Box 9814, Arlington 9, Va.
Douglas C. Whitaker Co., Box 271, Glenside, Pa.
Whitlock Associates, Inc., 21655 Coolidge Highway, Oak Park 37, Mich.
Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.
Wilkinson Co., 619 E. Tallmadge Ave., Akron 10, Ohio
Wyssmont Co., Inc., 42-07D 27th Street, Long Island City 1, N.Y.
Zack Radiant Heat Co., 23-A Vreeland St., Lodi, N.J.

Heaters & Heating Cylinders

Atlas Machine & Tool Corp., 259 Hackensack St., East Rutherford, N.J.
Chromalox, Inc., 7506 Thomas Blvd., Pittsburgh 8, Pa.
General Electric Co., Apparatus Sales Div., 1 River Rd., Schenectady 5, N.Y.
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Hotwatt, Inc., 75 Maple St., Danvers, Mass.
Industrial Heater Co., Inc., 417 Canal St., New York 13, N.Y.
Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, Ohio
New Jersey Thermex Co., Inc., 531 Bergen St., Harrison, N.J.
Thermel, Inc., 9400 Robinson Rd., Franklin Park, Ill.
Vulcan Electric Co., 88 Holten St., Danvers 32, Mass.
Watlow Electric Mfg. Co., 1376 Ferguson Ave., St. Louis 14, Mo.

Hopper Loaders

Goulding Mfg. Co., 2929 River St., Saginaw, Mich.
Injection Molders Supply Co., 17601 South Miles Road, Cleveland 28, Ohio
Ketchpel Engineering Co., 1401-04 Palisade Ave., W. Englewood, N.J.
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
Rainco Mfg., Inc., R.D. #2, Franklin, Pa.
The Rainville Co., 839 Stewart Avenue, Garden City, N.Y.
Robbins Plastic Machinery Corp., 1430 Mishawaka St., Elkhart, Ind.
Spencer Turbine Co., 486 New Park Ave., Hartford 6, Conn.
Thoreson-McCosh, Inc., 18208 McNichols Rd., Detroit 19, Mich.
Whitlock Associates, Inc., 21655 Coolidge Highway, Oak Park 37, Mich.

Hydraulic Systems

Berthelsen Engineering, P.O. Box 1423, Joliet, Ill.
Clifton Hydraulic Press Co., 289 Alwood Rd., Clifton, N.J.
Consolidated Baling Machine Co., 408-L Third Ave., Brooklyn 15, N.Y.
Continental Machinery Co., Inc., 261 Broadway, New York 7, N.Y.
Dake Corp., 641 Robbins Rd., Grand Haven, Mich.
Erie Engine & Mfg. Co., 953 E. 12th St., Erie, Pa.
French Oil Mill Machinery Co., 1040 W. Greene St., Piqua, Ohio
GPE Controls, Inc., 240 E. Ontario St., Chicago 11, Ill.
Goulding Manufacturing Co., 2929 River St., Saginaw, Mich.
Greer Hydraulics, Inc., N.Y. International Airport, Jamaica 30, N.Y.
Hannifin Co., Div. of Parker-Hannifin Corp., 554D S. Wolf Road, Des Plaines, Ill.
Guy P. Harvey & Son Corp., 40 Spruce St., Leominster, Mass.
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Hull Corp., Hatboro, Pa.
Hydraulic Press Mfg. Co., Div. of Koehring Co., Marion Rd., Mt. Gilead, Ohio
Industrial Hydraulic Machine & Design Co., 33 W. Inman Ave., Rahway, N.J.
Johnson Machinery Co., 90 Elizabeth Ave., Elizabeth, N.J.
Kabar Mfg. Corp., 180-B Babylon Turnpike, Roosevelt, L.I.
Karlton Machinery Corp., 210 E. Ohio St., Chicago 11, Ill. (Rep. for Becker & Van Hullen)
The C. A. Lawton Co., 233 N. Broadway, De Pere 1, Wisconsin
Logan Hydraulics, Inc., 4901 W. Lawrence Ave., Chicago 30, Ill.
Mayflower Electronic Devices, Inc., 20 Industrial Ave., Little Ferry, N.J.
Oilgear Co., 1560 W. Pierce St., Milwaukee, Wis.
Possis Machine Corp., 1645 Hennepin Avenue, Minneapolis 3, Minn.
Racine Hydraulics & Machinery, Inc., 2000 Albert St., Racine, Wis.
Rodgers Hydraulic, Inc., 7401 Walker St., Minneapolis 26, Minn.
Stanford Engineering Co., Box 329, Salem, Ill.
Ralph B. Symons Associates, Inc., 3571 Main Rd., Tiverton, R.I.
R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Indicators, Machine Cycle

Foster & Allen, Inc., 26 Commerce St., Chatham, N.J.
The Foxboro Co., 38 Neponset Ave., Foxboro, Mass.
Industrial Nucleonics Corp., 1205 Chesapeake Ave., Columbus 26, Ohio
Minneapolis-Honeywell Regulator Co., 2753 Fourth Avenue S., Minneapolis 8, Minn.
Pratt & Whitney Co., Inc., Charter Oak Blvd W. Hartford 1, Conn.
Seely Instrument Co., Inc., 377 Fourth St Niagara Falls, N.Y.
Taylor Instrument Companies, 95 Ames St Rochester 1, N.Y.

Indicators, Pressure

Fischer & Porter Co., Warminster, Pa.
Leeds & Northrup Co., 4901 Stenton Ave. Philadelphia 44, Pa.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Avenue, S., Minneapolis 8, Minn.
Taber Instrument Corp., 107 Goundry St., N. Tonawanda, N.Y.
Taylor Instrument Companies, 95 Ames St., Rochester 1, N.Y.
Testing Machines, Inc., 72 Jericho Turnpike, Mineola, N.Y.
United Electric Controls Co., 85 School St., Watertown 72, Mass.
United Sensor & Control Corp., 122 Naubuc Ave., Glastonbury, Conn.
Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N.J.
Weston Instruments, Div. of Daystrom, Inc., 614 Frelinghuysen Ave., Newark 12, N.J.

Indicators, Temperature

American Instrument Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Barber-Colman Co., Wheelco Instruments Div., 1300 Rock St., Rockford, Ill.
Electric Auto-Lite Co., General Products Group, Champlain, Toledo 1, Ohio
Electronic Processes Corp. of Calif., 436 Bryant, San Francisco 7, Calif.
Fisher Scientific Co., 711 Forbes Ave., Pittsburgh 19, Pa.
The Foxboro Co., 38 Neponset Ave., Foxboro, Mass.
Industrial Development Laboratories, Inc., 982 River Rd., Edgewater, N.J.
Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Avenue, S., Minneapolis 8, Minn.
Partlow Corp., 225 Campion Rd., New Hartford, N.Y.
Powers Regulator Co., 3400 Oakton St., Skokie 34, Ill.
Pyrometer Instrument Co., Inc., 92 Portland St., Bergenfield, N.J.
Pyrometer Service Co., Inc., 348 River Rd., N. Arlington, N.J.
Taylor Instrument Companies, 95 Ames St., Rochester 1, N.Y.
Testing Machines, Inc., 72 Jericho Turnpike, Mineola, N.Y.
United Electric Controls Co., 85 School Street, Watertown 72, Mass.
United Sensor & Control Corp., 122 Naubuc Ave., Glastonbury, Conn.
West Instrument Corp., 4263 W. Montrose Ave., Chicago 41, Ill.
Weston Instruments, Div. of Daystrom, Inc., 614 Frelinghuysen Ave., Newark 12, N.J.

Marking Machines

Ackerman Gould Co., 10 Neil Court, P.O. Box 188, Oceanside, N.Y.

The Acromark Co., 5-13 Morrell St., Elizabeth 4, N.J
Apex Machine Co., 14-13—118 Street, College Point 56, N.Y.
Defiance Machine & Tool Co., 1920 S. Vandeventer Ave., St. Louis 10, Mo.
Gane Bros. & Lane, Inc., 1335 W. Lake St., Chicago 7, Ill.
Halvorfold Kwikprint Co., 700 E. Union, Jacksonville, Fla.
Industrial Marking Equipment Co., Inc., 655 Berriman St., Brooklyn 8, N.Y.
Kingsley Machines, 850 Cahuenga Blvd., Hollywood 38, Calif.
Markem Machine Co., 150 Congress St., Keene 20, N.H.
James H. Matthews & Co., 3829 Forbes Ave., Pittsburgh 13, Pa.
Olsenmark Corp., 124-132 White St., New York 13, N.Y.
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
Peerless Roll Leaf Co., Inc., 4511 New York Avenue, Union City, N.J.
Skyline Industries, Titusville, Pa.
Superior Roll Leaf Mfrs., Inc., 14 Porter St., Hackensack, N.J.
Swan Machine Corp., 320 Fifth Avenue, New York 1, N.Y.
Weber Hot Stamping Equipment Co., 3253 N. Kedzie Ave., Chicago 13, Ill.

Mixers

Abbe Engineering Co., 420C Lexington Avenue, New York 17, N.Y.
Paul O. Abbe, Inc., 257 Center Avenue, Little Falls, N.J.
Blaw-Knox Co., 300 Sixth Avenue, Pittsburgh 22, Pa.
Arthur Colton Co., Div. of Snyder Corp., 3400 E. Lafayette St., Detroit 7, Mich.
D. C. Cooper Co., 1467 S. Michigan Ave., Chicago 5, Ill.
Crown Machinery, Inc., 2721 S. San Pedro St., Los Angeles 11, Calif.
Dake Corp., 641 Robbins Rd., Grand Haven, Mich.
The J. H. Day Co., Div. of Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, O.
J. P. Devine Mfg. Co., 49th St. & A.V.R.R., Pittsburgh 1, Pa.
Entoleter Div., Safety Industries, Inc., 1187 Dixwell Ave., New Haven, Conn.
Ferro Corp., Patterson Equipment Div., E. Liverpool, Ohio
First Machinery Corp., 209-289—10th St., Brooklyn 15, N.Y.
Getty Machine & Mold, Inc., 384 Getty Ave., Clifton, N.J.
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Injection Molders Supply Co., 17601 South Miles Road, Cleveland 28, Ohio
Johnson Machinery Co., 90 Elizabeth Ave., Elizabeth, N.J.
Lupoline Automatic Polishing Equipment Corp., 4510 Bullard Ave., Bronx 70, N.Y.
Machinery & Equipment Co., Inc., 123 Townsend St., San Francisco 7, Calif.
Franklin P. Miller & Son, 36 Meadow Street, E. Orange 16, N.J.
Patterson Foundry and Machine Co., 1250 St. George Street, E. Liverpool, Ohio
The Patterson-Kelley Co., Inc., E. Stroudsburg, Pa.
Prodex Corp., King George Road, Fords, N.J.
The Rainville Co., Inc., 839 Stewart Avenue, Garden City, N.Y.
Read Standard, Div. of Capitol Products Corp., 901 S. Richland Ave., York, Pa.
Reed Plastics Corp., 116 Gold Street, Worcester 8, Mass.
Reliable Rubber & Plastics Machinery Co., Inc., 2014 Union Turnpike, No. Bergen, N.J.
Charles Ross & Son Co., 148 Classon Ave., Brooklyn 5, N.Y.
Sprout, Waldron & Co., Inc., 130 Logan Street, Muncy, Pa.
The Strong-Scott Mfg. Co., 451 Taft St. N.E., Minneapolis 13, Minn.
Sturtevant Mill Co., 103 Clayton Street, Boston, Mass.
Young Machinery Co., Inc., R.D. #2, Muncy, Pa.

Mold Chillers

Al-Be Industries, 9516 Rayo Street, South Gate, Calif.
Anson Tools & Gages, Inc., 1504 W. 12th St., Erie, Pa.
Artisan Metal Products, Inc., 63 Pond St., Waltham 54, Mass.
Blaw-Knox Co., 300 Sixth Avenue, Pittsburgh 22, Pa.
Dean Panel Coil, Dean Products, Inc., 1048 Dean St., Brooklyn 38, N.Y.
Frank W. Egan & Co., 671 S. Adamsville Rd., Somerville, N.J.
Electric Trading Co., 313-315 Canal St., New York 13, N.Y.
Gerin Mfg. Co., Inc., 683-685 N. 5th St., Newark 7, N.J.
Goulding Mfg. Co., 2929 River St., Saginaw, Mich.
Industrial Ovens, Inc., 13825 Triskett Rd., Cleveland 11, Ohio
Injection Molders Supply Co., 17601 South Miles Road, Cleveland 28, Ohio
L & P Tool Co., 2861 Sidney Avenue, Cincinnati 25, Ohio
Lembo Machine Works, Inc., 248 E. 17th St., Paterson 4, N.J.
Liberty Machine Co., Inc., 275 Fourth Ave., Paterson 4, N.J.
Mayer Refrigerating Engineers, Inc., Boonton Turnpike, Lincoln Park, N.J.
Mercury Industries, Inc., 365 Broadway, Hillsdale, N.J.
Mercury Molding Machinery, Inc., 972 Nepperhan Ave., Yonkers, N.Y.
Modern Plastic Machinery Corp., 64 Lakeview Avenue, Clifton, N.J.
Motch & Merryweather Machinery Co., 1258 E. 222nd St., Cleveland 17, Ohio
National Rubber Machinery Co., 57 W. Exchange St., Akron 8, Ohio
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
Pecorp, Inc., Basin Rd., P.O. Box 3164, Wilmington 4, Delaware
The Rainville Co., Inc., 839 Stewart Avenue, Garden City, New York
Saren, Inc., 816 N. Kostner Ave., Chicago 51, Ill.
T. Shriver & Co., Inc., 808 Hamilton St., Harrison, N.J.
Sterling, Inc., 5200 W. Clinton Ave., Milwaukee, Wis.
Tenney Engineering, Inc., 1090 Springfield Rd., Union, N.J.
John Verduin Machine Corp., 345-357 Tenth Ave., Paterson 4, N.J.
Vic Mfg. Co., 1313 Hawthorne Avenue, Minneapolis, Minn.
Waldron-Hartig Div., Midland-Ross Corp., P.O. Box 791, River Road, New Brunswick, N.J.
Wilkinson Co., 619 E. Tallmadge Ave., Akron 10, Ohio

Mold Heating

American Hydrotherm Corp., 10-55 Jackson Ave., Long Island City 1, N.Y.
Blaw-Knox Co., 300 Sixth Avenue, Pittsburgh 22, Pa.
E. B. Blue Co., 651 Connecticut Avenue, S. Norwalk, Conn.
Briscoe Mfg. Co., 1055 Gibbard Ave., Columbus 3, Ohio
Clifton Hydraulic Press Co., 289 Allwood, Clifton, N.J.
Conapac Corp., 120 E. 13th Street, New York 3, N.Y. (U.S. & Canadian Dist. for Hydro-Chemie Ltd.)
D. C. Cooper Co., 1467 S. Michigan Ave., Chicago 5, Ill.
Dean Panel Coil, Dean Products, Inc., 1048 Dean St., Brooklyn 38, N.Y.
Devco Engineering, Inc., Peir Lane, W. Caldwell, N.J.
Electric Trading Co., 313-315 Canal St., New York 13, N.Y.
Erinac Equipment Corp., 225 Lafayette St., New York 12, N.Y.
Falcon Equipment Co., 13th Street, New Brighton, Pa.
General Electric Co., Apparatus Sales Div., 1 River Rd., Schenectady 5, N.Y.
Gerin Mfg. Inc., 683-685 N. 5th St., Newark 7, N.J.
Glenn Electric Heater Corp., 372 Jelliff Ave., Newark 8, N.J.
Grieve-Hendry Co., Inc., 1401 W. Carroll Ave., Chicago 7, Ill.
Guild Electronics, Inc., Dynatherm Division, 388 Broadway, New York 13, N.Y.
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Hotwatt, Inc., 75 Maple St., Danvers, Mass.
Improved Machinery, Inc., 150 Burke St., Nashua, N.H.
Industrial Heater Co., Inc., 417 Canal St., New York 13, N.Y.
Industrial Mfg. Corp., 31 E. Georgia St., Indianapolis 4, Ind.
Injection Molders Supply Co., 17601 South Miles Road, Cleveland 28, Ohio
Mercury Molding Machinery, Inc., 972 Nepperhan Avenue, Yonkers, N.Y.
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
Pantex Mfg. Corp., 520 Roosevelt Avenue, Pawtucket, R.I.
Powers Regulator Co., 3400 Oakton St., Skokie 34, Ill.
The Rainville Co., Inc., 839 Stewart Avenue, Garden City, New York
Robbins Plastic Machinery Corp., 1430 Mishawaka St., Elkhart, Ind.
W. S. Rockwell Co., 200 Eliot Street, Fairfield, Conn.
Sterling, Inc., 5200 West Clinton Avenue, Milwaukee 18, Wis.
Thermel, Inc., 9400 Robinson Road, Franklin Park, Ill.
John Verduin Machine Corp., 345-357 Tenth Avenue, Paterson 4, N.J.
Watlow Electric Mfg. Co., 1376 Ferguson Avenue, St. Louis 14, Mo.
Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.

Mold Parts, Standard

Crucible Steel Co. of America, P.O. Box 2518, Pittsburgh 30, Pa.
Damen Tool & Engineering Co., Inc., 4621-4627 N. Olcott Ave., Chicago 31, Ill.
Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit, Mich.
National Tool & Mfg. Co., 100 N. 12th St., Kenilworth, N.J.
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
Van Dorn Iron Works Co., 2685 East 79th St., Cleveland 4, Ohio

Molds and Dies

ABA Tool & Die Co., Inc., 1395 Tolland Turnpike, Manchester, Conn.
Ace Tool & Manufacturing Co., 532 Mulberry St., Newark 5, N.J.
Air-Formed Products Corp., Pine Street Extension, Nashua, N.H.
Akromold, Inc., 102 W. Wilbeth Rd., Akron 1, Ohio
Akron Presform Mold Co., 2038 Main St., Cuyahoga Falls, Ohio
Akron Standard Mold Co., 1624 Englewood Ave., Akron 5, Ohio
Alliance Mold Co., Inc., 1300 Mt. Read Blvd., Rochester 6, N.Y.
Allied Mfg. Co., 2200—25th Avenue, S., Seattle 44, Wash.
Allied Plastic Mold, Inc., 17 Vreeland St., Lodi, N.J.
Anderson Die & Mfg. Co., 6840 S.W. Macadam, Portland 19, Ore.
Anson Tools & Gages, Inc., 1504 W. 12th Street, Erie, Pa.
Astor Tool & Die Co., 5-01 47th Road, Long Island City 1, N.Y.
Atlantic Mfg. Co., Ninth & Master Streets, Philadelphia 22, Pa.
Atols Tool & Mold Corp., 5005 W. Armitage, Chicago 39, Ill.
Avsco, Inc., 940 Isley Blvd., Excelsior Springs, Mo.
B & E Electroform Co., Greely Avenue, Union, N.J.
Bart Mfg. Corp., 227 Main Street, Belleville 9, N.J.
George K. Baumgartl's, Engravings, 149 Belleville Ave., Belleville 9, N.J.
Beacon Die-Mold, Inc., 57 Crooks Ave., Clifton, N.J.
Beazy's Moldmakers, 323 W. Fifth, Box 338, Peru, Ind.
Beel Engineering Co., 411 Mulberry St., Newark 2, N.J.
Ber-Design Associates, 41 Smith Street, Irvington 11, N.J.
Bergen Mold & Engineering, 115 Route 46, Little Ferry, N.J.
Bermer Tool & Die, Inc., Golf Street, Southbridge, Mass.
Bondy Engineering Co., 172 S. Portland Ave., Brooklyn 17, N.Y.

Chicago Mold Engineering Co., Inc., 4141 Washington Blvd., Hillside, Ill.
Lawrence H. Cook, Inc., 65 Massasoit Ave., East Providence 14, R.I.
Cowan Plastic Products Corp., 50 Aleppo Street, Providence 9, R.I.
Cumberland Tool Works, 1317 W. Grand Ave., Chicago 22, Ill.
Damac Tool Co., 456 East 166 Street, Bronx 56, N.Y.
Damen Tool & Engineering Co., Inc., 4621-47 N. Olcott Ave., Chicago 31, Ill.
Daniels-Kummer Engraving Co., 348 N. Addison Rd., Addison, Ill.
Dayton Rogers Mfg. Co., 2834—13th Ave., S., Minneapolis 7, Minn.
Delkay Plastics Corp., 13441 S. Western Ave., Gardena, Calif.
Detroit Mold Engineering Co., 6686 McNichols Rd., Detroit 12, Mich.
Diamond Plastic Industries, Inc., 1215 Midvale Ave., S.W., Roanoke, Va.
Diemolding Corp., 125 Rasbach St., Canastota, N.Y.
E-W Mold & Tool Co., Inc., 618 E. Market St., Indianapolis 6, Ind.
Electro Plastics Corp., 1201 Levee St., Dallas 7, Texas
Enduro Tool & Engineering Co., 4134 W. Chicago Ave., Chicago 51, Ill.
Engelking Patterns, Inc., 1537 Hutchins Ave., Columbus, Ind.
Erinac Equipment Corp., 225 Lafayette St., New York 12, N.Y.
Euclid Engineering Co., 1st & A Sts., Upland, Calif.
Evans-Zeier Plastic Co., Highway 51 (Zeier Service Rd.), Madison 4, Wis.
Excel-Mold, Inc., 939 E. Troy Ave., Indianapolis 3, Ind.
F & F Mold & Die Works, Inc., 103 Sachs St., Dayton 3, Ohio
Fortney Mfg. Co., Inc., 247 New Jersey Railroad Ave., Newark, N.J.
Garfield Mfg. Co., 10 Midland Ave., Wallington, N.J.
General Die Mold Co., 548 N. Sacramento Blvd., Chicago 12, Ill.
The General Industries Co., Taylor & Olive Streets, Elyria, Ohio
General Machine & Tool Works, 40261 13 Mile Road, Walled Lake, Mich.
Getty Machine & Mold, Inc., 384 Getty Ave., Clifton, N.J.
Gibson Associates, Inc., 390 North Avenue E., Cranford, N.J.
C. L. Gougler Machine Co., 705-69 Lake St., Kent, Ohio
Wm. M. Gulliksen Mfg. Co., Newton Lower Falls 62, Mass.
G-W Plastics Engineers, Inc., Bethel, Vt.
Hartbauer Tool & Die Co., 817 N.W. 23rd Ave., Portland 10, Ore.
Frank Hedrix Co., 14908 Verdura Rd., Paramount, Calif.
Hinchman Mfg. Co., Inc., 259 E. First Ave., Roselle, N.J.
Imperial Tool & Die Co., 1198 Adams Ave., Philadelphia 24, Pa.
Industrial Engineering Service, Washington Street, S. Easton, Mass.
Andrew C. Karlstad, 4146 Ventura Canyon Ave., Sherman Oaks, Calif.
Kerrco, Box 4178, Havelock Station, Lincoln 7, Neb.
E. B. Kingman Co., 96 Exchange St., Leominster, Mass.
The John Kunst Co., 41 Murray Street, New York 7, N.Y.
Leominster Tool Co., Inc., 272 Whitney Street, Leominster, Mass.
Liberty Tool & Machine Co., 18 S. 20th Street, Irvington 11, N.J.
J. Many & Co., 153 Lafayette St., New York 13, N.Y.
Midland Die & Engraving Co., 502 Factory Road, Addison, Ill.
Modern Designers, 4330 E. 10th Court, Hialeah, Fla.
Modern Tool & Die Co., Inc., 11 Spruce Street, Leominster, Mass.
Mojave Die & Engraving, 5729 S. Hoover, Los Angeles 37, Calif.
C. J. Mold & Machine Corp., Locust St., Keyport, N.J.
Mold Duplicating Co., 750 Fairfield Ave., Kenilworth, N.J.
Moldcraft, Inc., 1505 W. 41st Street, Baltimore 11, Md.
National Fabricating Co., 129-01 N. Conduit Ave., S. Ozone Park 20, N.Y.
New England Die Co. Inc., 64 Floral St., Taunton, Mass.
Newark Die Co., 24 Scott Street, Newark 2, N.J.
Niles Corp., 50941 U.S. #31, S. Bend 17, Ind.
North Star Industries, Inc., 2418 University Ave., S.E., Minneapolis, Minn.
Nu-Engineering, Inc., 1515 Bonner Ave., Ferndale 20, Mich.
Oak Engineering Co., Inc., 110 Monmouth St., Gloucester City, N.J.
Oakley Die & Mfg. Co., Inc., 4426 Brazee St., Cincinnati 9, Ohio
Palfy Die & Mold Co., 2900 Bradwell Ave., Cleveland 29, Ohio
Pearce Simpson, Inc., Molded Plastics Div., 3950 N.W. 28th St., Miami, Fla.
Plastic Engineering Co., Dunnell Lane, Pawtucket, R.I.
Plastic Mold & Tool Co., 7347 State Rd., Philadelphia 35, Pa.
Plastic Mold Tool & Die Co., Inc., 1 Maple St., E. Rutherford, N.J.
Plas-Tool Co., 8050 N. Lawndale Ave., Skokie, Ill.
Primas Moldmakers, Inc., 240 Sheridan Ave., Buffalo 11, N.Y.
Process Mold Co., 19665 Schoenherr Ave., Detroit 5, Mich.
Progresswerk, P.O. Box 163, Cooper Station, New York 3, N.Y.
Rayette, Inc., 261 East 5th Street, St. Paul 1, Minn.
Rochelle Plastic Mold Co., Inc., 35 Sebago St., Clifton, N.J.
David H. Rosenstock, 401 Broadway, New York 13, N.Y.
Alfred A. Rosenthal, 3 Park Row, New York 38, N.Y.
The Milton Ross Co., 237 Jacksonville Rd., Hatboro, Pa.
Royal Mfg. Co., Inc., 200 N. Granite, Prescott, Ariz.
S-K-W Mfg. Co., 4630 N. Lamon Ave., Chicago 30, Ill.
Sarcol Foundry & Pattern Corp., 3050-52 W. Taylor St., Chicago 12, Ill.
Richard O. Schulz Co., 2425 W. 75 Avenue, Elmwood Park 35, Ill.
Shaw Industries, Inc., RD#2, Franklin, Pa.
Sheller Mfg. Corp., S. Bridge St., Portland, Ind.
Sierra Electric Corp., 15100 S. Figueroa, Gardena, Calif.
A. J. Simons, Georgetown Rd., Polk, Pa.
Sinko Mfg. & Tool Co., 7310 W. Wilson Ave., Chicago 31, Ill.
Sperzel Co., 2845 Harriet Ave., Minneapolis 8, Minn.
Springfield Tool & Die Co., Inc., 109 Springfield Ave., Springfield, N.J.
Standard Tool Co., 203 Hamilton Street, Leominster, Mass.
Stokes-Trenton, Inc., 150 Enterprise Ave., Trenton 9, N.J.
Strabeg Machine Co., 817 East 140 Street, Bronx 54, N.Y.
Stricker-Brunhuber Corp., 19 W. 24th St., New York 10, N.Y.
J. G. Tilp, Inc., Milltown Road, Union, N.J.
Timely Products Co., 308 Rogers Road, Des Moines 15, Iowa
Union Tool & Engineering Co., 332-336 Jones St., Dayton 10, Ohio
United Fabricators & Electronics, Inc., Myrtle & Water Sts., Stillwater, Minn.
U.S. Stoneware Co., 12 East Ave., Tallmadge, Ohio
Victor Kellering, Inc., 955 East 51st Street, Brooklyn 3, N.Y.
Voges Mfg. Co., Inc., 103-11 98th Street, Ozone Park 17, N.Y.
Waterbury Companies, Inc., 835 S. Main, Waterbury 90, Conn.
Welch Plastics & Mfg. Co., Inc., 814 W. Third Ave., Columbus 8, Ohio
Wess Plastic Molds, Inc., 601 Second Avenue, New Hyde Park, N.Y.
Westech Engineering, 483 Robert Ave., Santa Clara, Calif.
Western Specialty Mfg. Corp., Municipal Airport, P.O. Box 2192, Cheyenne, Wyo.
Wiener Precision Laboratories, 975 Close Ave., Bronx, N.Y.
Wylie & Green, 2544 Fairhill Ave., Glenside, Pa.
Charles Zapf & Co., 2423 Main St., Evanston, Ill.

Nozzles, Injection Machines

Anson Tools & Gages, Inc., 1504 West 12th Street, Erie, Pa.
Atlas Machine & Tool Corp., 259 Hackensack St., East Rutherford, N.J.
Blaw-Knox Co., 300 Sixth Avenue, Pittsburgh 22, Pa.
Brush Beryllium Co., 4301 Perkins Ave., Cleveland 3, Ohio
Clifton Hydraulic Press Co., 289 Allwood Rd., Clifton, N.J.
Header Tool Co., 24474 Telegraph Rd., Southfield, Mich.
Industrial Hydraulic Machine & Design Co., 33 W. Inman Ave., Rahway, N.J.
Injection Molders Supply Co., 17601 South Miles Rd., Cleveland 28, Ohio
Melt Extractor Mfg. Corp., 3040 Webster Ave., New York 67, New York
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
Rainco Mfg., Inc., R.D. #2, Franklin, Pa.
Standard Tool Co., 203 Hamilton Street, Leominster, Mass.

Ovens, Drying

Acme Machinery & Mfg. Co., Inc., 500 Sawmill River Rd., Yonkers 2, N.Y.
American Instrument Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
Binks Mfg. Co., 3114 W. Carroll Ave., Chicago 12, Ill.
Blaw-Knox Co., 300 Sixth Avenue, Pittsburgh 22, Pa.
E. B. Blue Co., 651 Connecticut Avenue, S. Norwalk, Conn.
I. G. Brenner Co., 32 East North St., Newark, Ohio
Brosites Machine Co., Inc., 50 Church St., New York 7, N.Y.
Arthur Colton Co., Div. of Snyder Corp., 3400 E. Lafayette St., Detroit 7, Mich.
Continental Machinery Co., Inc., 261 Broadway, New York 7, N.Y.
D. C. Cooper Co., 1467 S. Michigan Ave., Chicago 5, Ill.
F. C. Dawson Engineering Co., 641 Washington St., Canton, Mass.
The DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio
J. P. Devine Mfg. Co., 49th St. & A.V.R.R., Pittsburgh 1, Pa.
Drying Systems Co., 1800 Foster Avenue, Chicago 40, Ill.
Electric Hot Pack Co., Inc., Cottman Ave. at Melrose St., Phila. 35, Pa.
Ferro Corp., Patterson Equipment Div., E. Liverpool, Ohio
Fisher Scientific Co., 711 Forbes Ave., Pittsburgh 19, Pa.
Fostoria Corp., Infrared Division, Fostoria, Ohio
Grieve-Hendry Co., Inc., 1401 W. Carroll Ave., Chicago 7, Ill.
Guild Electronics, Inc., Dynatherm Div., 388 Broadway, New York 13, N.Y.
Herbert Products, Inc., 74-32 Jamaica Ave., Woodhaven 11, New York (U. S. Rep. for Imperial Chemical Industries, Ltd., Plastics Div.)
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Industrial Ovens Inc., 13825 Triskett Rd., Cleveland 11, Ohio
Injection Molders Supply Co., 17601 South Miles Rd., Cleveland 28, Ohio
Inta Roto Machine Co., Inc., P.O. Box 454, Richmond 3, Va.
Johnson Machinery Co., 90 Elizabeth Ave., Elizabeth, N.J.
Leon Machine & Engineering Co., 61 Whittaker St., Riverside, N.J.
C. A. Litzler Co., Inc., 235 Brookpark Rd., Cleveland 9, Ohio
Lydon Bros., Inc., 85 Zabriskie St., Hackensack, N.J.
Mercury Molding Machinery, Inc., 972 Nepperhan Ave., Yonkers, N.Y.
Michigan Oven Co., 415 Brainard St., Detroit 1, Mich.
Miskella Infra-Red Co., Inc., E. 73rd & Grand Ave., Cleveland 4, Ohio
Modern Plastic Machinery Corp., 64 Lakeview Avenue, Clifton, N.J.
Radiant Heat Enterprises, Inc., 630 Morris & Essex Turnpike, Short Hills, N.J.
The Rainville Co., Inc., 839 Stewart Ave., Garden City, N.Y.
Randall Mfg. Co., Inc., 801 Edgewater Rd., New York 59, New York
Ransohoff Co., N. 5th St., & Ford Blvd., Hamilton, Ohio
W. S. Rockwell Co., 200 Eliot St., Fairfield,

Conn.
Tenney Engineering Inc., 1090 Springfield Rd., Union, N.J.
Douglas C. Whitaker Co., Box 271, Glenside, Pa.
Young Bros. Co., 1823 Columbus Rd., Cleveland 13, Ohio

Preplasticizing Units

The Bonnot Co., 722 Mulberry Ave., S.E., Canton 2, Ohio
Crown Machine & Tool Co., 2800 W. Lancaster St., Ft. Worth, Texas
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Hydraulic Press Mfg. Co., Marion Rd., Mt. Gilead, Ohio
Johnson Machinery Co., 90 Elizabeth Ave., Elizabeth, N.J.
Melt Extractor Mfg. Corp., 3040 Webster Ave., New York 67, N.Y.
Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio
Omni Products Corp., 460 Fourth Avenue, New York 16, N.Y.
The Rainville Co., Inc., 839 Stewart Avenue, Garden City, N.Y.
Watson-Stillman Press Div., Farrel-Birmingham Co., Inc., 565 Blossom Rd., Rochester 10, N.Y.

Pumps, Hydraulic

Allis-Chalmers Mfg. Co., 1163 S. 70th St., Milwaukee 1, Wis.
Baldwin-Lima-Hamilton Corp., Phila. Nat'l. Bank Bldg., Phila. 7, Pa.
Berthelsen Engineering, P.O. Box 1423, Joliet Ill.
John Dusenbery Co., Inc., 376 Allwood Rd., Clifton, N.J.
Elmes Engineering Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Farrel-Birmingham Co., Inc., Ansonia, Conn.
French Oil Mill Machinery Co., 1040 W. Greene St., Piqua, Ohio
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Hydraulic Press Mfg. Co., Marion Rd., Mt. Gilead, Ohio
Johnson Machinery Co., 683 Frelinghuysen Ave., Newark 5, N.J.
Lincoln Engineering Co., 4010 Goodfellow, St. Louis 20, Mo.
Machinery & Equipment Co., Inc., 123 Townsend St., San Francisco 7, Calif.
Manton-Gaulin Mfg. Co., Inc., 44 Garden St., Everett 49, Mass.
The Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Racine Hydraulic & Machinery, Inc., 2000 Albert St., Racine, Wis.
Ralph B. Symons Associates, Inc., 3571 Main Rd., Tiverton, R.I.
Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N.J.

Regulators, Machine Cycle

Eagle Signal Corp., 202—20th St., Moline, Ill
Electronic Processes Corp. of Calif., 436 Bryant, San Francisco 7, Calif.
Foster & Allen, Inc., 26 Commerce St., Chatham, N.J.
The Foxboro Co., 38 Neponset Ave., Foxboro Mass.
GPE Controls Inc., 240 E. Ontario St., Chicago 11, Ill.
General Electric Co., Apparatus Sales Div., 1 River Rd., Schenectady 5, N.Y.
Glenn Electric Heater Corp., 372 Jelliff Ave., Newark 8, N.J.
Partlow Corp., 225 Campion Rd., New Hartford, N.Y
Plastics by Chapman, 1220 S. 49th St., Richmond, Calif.
Reliance Electric & Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio
Seely Instrument Co., Inc., 377 Fourth St., Niagara Falls, N.Y.
Taylor-Emmett Controls, Inc., 445 E. Turkeyfoot Lake Rd., Akron 19, Ohio
Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N.J.
G. C. Wilson & Co., 1915 Eighth Ave., Huntington, W. Va.

Regulators, Pressure

Fischer & Porter Co., Warminster, Pa.
The Foxboro Co., 38 Neponset Ave., Foxboro, Mass.
GPE Controls Inc., 240 E. Ontario St., Chicago 11, Ill.
Gabriel Mfg. Co., 15 Maple Ave., Haverstraw, N.Y.
General Electric Co., Apparatus Sales Div., 1 River Rd., Schenectady 5, N.Y.
Helicoid Gage Div., American Chain & Cable, 929 Connecticut Ave., Bridgeport 2, Conn.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa.
Leslie Co., 214 Leslie Bldg., Lyndhurst, N.J.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., S., Minneapolis 8, Minn.
Powers Regulator Co., 3400 Oakton St., Skokie 34, Ill.
Taylor Instrument Companies, 95 Ames St., Rochester 1, N.Y.
United Electric Controls Co., 85 School St., Watertown 72, Mass.
Weston Instruments, Div. of Daystrom, Inc., 614 Frelinghuysen Ave., Newark 12, N.J.

Regulators, Temperature

Application Engineering Corp., P.O. Box 334, Park Ridge, Ill.
Barber-Colman Co., Wheelco Instruments Div., 1300 Rock St., Rockford, Ill.
Electric Auto-Lite Co., General Products Group, Champlain, Toledo 1, Ohio
Electronic Processes Corp. of Calif., 436 Bryant, San Francisco 7, Calif.
Fenwal, Inc., Pleasant St., Ashwald, Mass.
Fischer & Porter Co., Warminster, Pa.
The Foxboro Co., 38 Neponset Ave., Foxboro, Mass.
General Electric Co., Apparatus Sales Div., 1 River Rd., Schenectady 5, N.Y.
Glenn Electric Heater Corp., 372 Jelliff Ave., Newark 8, N.J.
Industrial Mfg. Corp., 31 E. Georgia St., Indianapolis 4, Ind.
Jones Motorola Corp., 432 Fairfield Ave., Stamford, Conn.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa.
Leslie Co., 214 Leslie Bldg., Lyndhurst, N.J.
Mayer Refrigerating Engineers, Boonton Turnpike, Lincoln Park, N.J.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., S., Minneapolis 8, Minn.
The Partlow Corp., 225 Campion Rd., New Hartford, N.Y.
Powers Regulator Co., 3400 Oakton St., Skokie 34, Ill.
Pyrometer Instrument Co., Inc., 92 Portland St., Bergenfield, N.J.
Reliance Electric & Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio
Sarco Co., Inc., 635 Madison Ave., New York 22, N.Y.
Sterling, Inc., 5200 W. Clinton Ave., Milwaukee 18, Wis.
Taylor Instrument Companies, 95 Ames St., Rochester 1, N.Y.
Thermo Electric Co., Inc., 109 Fifth St., Saddle Brook, N.J.
Thwing-Albert Instrument Co., 5398 Pulaski Ave., Philadelphia 44, Pa.
United Electric Controls Co., 85 School St., Watertown 72, Mass.
West Instrument Corp., 4263 W. Montrose Ave., Chicago 41, Ill.
Weston Instruments, Div. of Daystrom, Inc., 614 Frelinghuysen Ave., Newark 12, N.J.

Tumbling Barrels & Machines

Abbe Engineering Co., 420C Lexington Avenue, New York 17, N.Y.
Acme Machinery & Mfg. Co., Inc., 500 Saw Mill River Rd., Yonkers 2, N.Y.
Continental Machinery Co., Inc., 261 Broadway, New York 7, N.Y.
Crown Machinery, Inc., 2721 S. San Pedro St., Los Angeles 11, Calif.
Ferry Machine Co., W. Main St. Extension, Kent, Ohio
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Iniection Molders Supply Co., 17601 South Miles Rd., Cleveland 28, Ohio
H. W. Kramer Co., Inc., 120-30 Jamaica Ave., Richmond Hill 18, N.Y.
Lord Chemical Corp., 2068 S. Queen St., York, Pa.
Lupoline Automatic Polishing Equipment Corp., 4510 Bullard Ave., Bronx 70, N.Y.
Morse Mfg. Co., Inc., 727 W. Manlius St., East Syracuse, N.Y.
Omni Products Corp., 460 Fourth Ave., New York 16, N.Y.
Rampe Mfg. Co., 14915 Woodworth Ave., Cleveland 10, Ohio
Rainco Mfg. Co., Inc., 501 Third St., P.O. Box 788, Franklin, Pa.
Ransohoff Co., North 5th St. & Ford Blvd., Hamilton, Ohio
The R. R. Siebert Co., 183 St. Paul St., Rochester, N.Y.
Techline Div., Wheelabrator Corp., 1414 Avenue V, Vicksburg, Mich.
Tower Iron Works, Inc., 50 Borden St., Providence, R.I.
Tumb-L-Matic, Inc., St. Mary's Street, Stamford, Conn.

Weigh-Feeders

Exact Weight Scale Co., 919 W. 5th Ave., Columbus 15, Ohio
Glengarry Processes, Inc., Bay Shore, New York
B. F. Gump Co., 1325 S. Cicero Ave., Chicago 50, Ill.
Hochman Plastics Machinery Corp., 151 Mulberry St., Newark, N.J.
Mercury Heat Sealing Equipment Co., 2601-21 N. Howard St., Philadelphia 33, Pa.
Plastic Fabricants, Div. of The Woodman Co., Inc., 647 E. College Ave., Decatur, Ga.
Proctor & Schwartz, Inc., 7th St. & Tabor Rd., Philadelphia 20, Pa.
The Rainville Co., Inc., 839 Stewart Ave., Garden City, N.Y.
Richardson Scale Co., 688 Van Houten Ave., Clifton, N.J.
Syntron Co., P.O. Box 2200, Homer City, Pa.
Toledo Scale Corp., 1087 Telegraph Rd., Toledo 12, Ohio
Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N.J.
Weighing & Control Components, Inc., 206 Lincoln Avenue, Hatboro, Pa.

Guest Editorial

Photo by: Pach Bros., N.Y.

CHAYLIE SAXE*

What has happened to the shirtsleeve image?

When asked the nature of my topic, I replied that I was going to talk about knife handles, Santa Claus, a bowl of rice, Posy Rings, Thomas Edison, the high wire act, and the image of enterprise.

First, however, my credentials:

I'm here in several capacities—a representative of small business; a customer for the products of the chemical industry; and as an individual, like yourself, deeply concerned with the future of our industry and our country.

So there'll be no misrepresentation of my role as a businessman and customer, let me put my position in proper perspective by defining the size, dimension and objectives of my company and relate its importance to the chemical industry.

We're a nation of small business, really—with 75 per cent of American enterprise employing from one to three persons; 95 percent of business employing fewer than 20 persons; and 99 per cent of American business employing fewer than 100 persons.

There are only 7,300 firms employing over 500 people; that is "big business." This block constitutes 2/10ths of one percent of all American initiative. It accounts for 45% of the nations' employees.

These facts are presented in a very interesting booklet entitled, "The Story of Business; Large and Small" published by E. I. DuPont de Nemours of Wilmington, Delaware.

One fact must be recognized at this point. Most of the little businesses, and many of the medium sized ones, produce convenience only. They are the service businesses; the plumbers, the cleaners, the barbers, the retailers, now employing more than half of the nation's manpower . . . and account for more than half of the Gross National Product.

Now, my firm employs about 100 people and thereby falls into the 99 percent of-all-business-category. It's a manufacturing corporation. We produce, fabricate, upgrade, and ship products made from thermoplastic materials.

There are approximately 20,000 firms in this category; production firms that is, and we're the specialty acts in the great American circus of competitive, enterprise.

Being a small businessman is a daily, quote, experience, end quote, as we try to be successful in our chosen field. The problems of small business operation aren't new, but the opportunity to talk about those problems before an influential, if captive, audience, encourages me to share what I think is also a problem and challenge of big business . . . and America, itself.

Now let me address you in my role as a businessman —as a typical customer of the chemical industry, and as an individualist with some suggestions for the future, derived from 20 years of involvement in small business.

The effect of massive imports of foreign goods is a much bruited-about subject these days, and it's not a problem to be sneezed at. I'm not here, however, to scream for help and I am perfectly familiar with the fact that trade is a two-way street.

Our corporation, as an illustration, makes component parts for the appliance industry. Our molded parts are used in every domestically manufactured refrigerator. Wherever I travel—Canada, Panama, England, France, the Philippines—these products of our plant

*President of Saxe Brothers, Inc., Albany, Menands and Watervliet, N.Y.

have preceded me. The thrill remains when I find them all over the world, and by producing 80 million such units a year we are, in effect, blanketing the world market.

So far so good. Dampening my thrill of the moment is the fact that foreign-made appliances are gaining acceptance in the markets of the world. Three years ago, a raw materials supplier asked if we were having competition from Japan in this field. I said, "No," but if he asked the question today, I'd have to answer, "Only a little." Tomorrow the answer may be dramatically, chillingly, different.

Things change fast in any competitive element. Three years ago we purchased a small and failing plant in Watervliet, N.Y., that had been shipping about nine million plastic molded knife handles annually to the domestic cutlery trade. Today there is virtually no knife, fork and spoon handle business left for an American concern, and what there is is unprofitable. It's impossible to compete price-wise against the importations from Japan, Germany and Britain.

Let us examine what happened to a plant that employed 90 people when this occurred. Employment shrank to a dozen. The former owners sold out.

This plant had high minimum wages, regulated hours, and a typical American work force. These workers each had one or more cars, a television set, and each was filled with desire for more and better things from life. Unfortunately they crashed head-on into competition with a labor force that more often than not worked under minimal standards and got along with a bicycle, a crystal set and a bowl of rice.

Now we know that the eventual answer is to put these labor forces on a par in living standards and ambitions, but that solution is so long-range that you can't apply it to today's disruption.

What happens when your business hits this kind of wall?

You can become a Dun & Bradstreet statistic under the lengthy column of firms that couldn't make it.

You can get into new product lines—if! If you have the ability, the resources, available capital and a market.

You can merge or sell, but even that takes too long.

It takes a larger company with a burning desire to diversify or buy talent; or it takes a similar-size company with an urge to amalgamate problems.

Another possibility often occurs to you. You can turn importer, or you can even invest in a foreign plant. . . . Canada, Puerto Rico, Japan. It is surprising what the small businessman hears—(what I hear) about Bahamas corporations, about Swiss Banks, about tax forgiveness outside of the United States, about the recent added benefits derived from foreign subsidiaries. But there are problems, too, such as capital and little things like Castro-types.

These are the alternative answers which usually do little but paralyze the small business operators. He doesn't have the time, the money or even the inclination to follow big business into such a speculative type of future. For one thing, he's close to his employees and feels obligated to keep them employed. He's also a personal businessman with a strong community relationship.

In the case of our own plant in Watervliet we were in the fortunate position of being able to gamble on new product development. It took a lot of big business and small business help.

Alophe Menjou, the dapper actor, once said in describing his dramatic ability, "It took nine tailors." That's about what made it possible for us to come up with a successful new product called Posy Rings.

It took suggestions and inspiration from a major raw material supplier. It took a design firm in Detroit, a mold maker in Hoosick Falls, an advertising agency in New York and 18 long months of market testing, selling and the combined energies of our entire staff, all now thoroughly impressed with the fact that you can actually survive a gestation period of such duration. With sales approaching one-half million units we know we are winning this particular gamble.

During the same time interval, and through the combined efforts of dozens of other technical experts, we developed (in conjunction with the Colt Patent Firearms Company) a plastic cased wax bullet which is currently finding its way to market. We feel certain this product will also be a winner. Our Watervliet plant has begun production of a napkin dispenser which required the hardest kind of work in design, mold making, market testing, product planning and endless hours of development, well-loaded with prayer.

With one or two more new products on the drawing board and with considerable travail yet ahead of us, we are certain that the plant in Watervliet will return to its former position of full utilization of equipment and personnel. Perhaps our greatest pride will stem from the achievement of having brought back into employment some 70 or 80 people.

This movement-back-from-the-grave procedure not only made me a philosopher but it also gave me an insight on a few fine points of life which may not be profound, but I believe they're pertinent to survival.

First: We're not going to make an American future on the basis of free enterprise on a nine-to-five schedule.

And second: The comfort of tomorrow will be in jeopardy if Americans do not recognize their problems and show more determination in facing them.

In the pursuit of our business problems, we have been caught up lately in a search which might seem to you a strange one for a company as small as ours. One usually thinks of a "corporate image" being important only to large corporations.

Well, we, too, have been occupied lately examining our corporate position and looking for the best kind of "corporate image" for us to build in the minds of our customers. In this area, we have done a good deal of soul searching; we have been perplexed about our own image and about other corporate images. Also, I have been wondering about the national image as well.

There have been a variety of studies lately, usually motivated by companies or associations seeking to find out what the public thinks when "such-and-such" is mentioned. You've undoubtedly heard some of the results . . . the image of General Motors, a sleek Cadillac; General Electric, a fluorescent tube; Labor, a smoke-filled room, a cigar, a questionable leader and unaccountable expenditures of slush funds.

The image of Uncle Sam has become Santa Claus handing out gifts while recipients throw rocks.

There are countless examples, and they all have a very disturbing common denominator.

No image exists which depicts American enterprise as a vigorous man with his sleeves rolled up . . . working—whether with a wrench, an attache case, or a plow.

When I was a kid and the world was young, it seemed to me that Uncle Sam was frequently characterized with his sleeves rolled up. His good right arm was muscular. The working man was characterized in coveralls, wrench in hand. What has happened to the shirtsleeve image . . . where did it go? In fact, what has happened to the rolled-up sleeves at all?

We're apt to think of the American businessman as an Ivy League suit slumped over an expense account. Sure, that's inaccurate, but it results from an overexposure of Ivy League suits and expense accounts.

You've read the analysis of today written by the president of one of our largest advertising agencies—it appeared in Life.

He wrote, "This country is experiencing the great era of the goof-off; the age of the half-done job. It is populated with laundrymen who won't iron shirts; with waiters who won't serve; with carpenters who will come around someday, maybe; with executives whose minds are on the golf course; with teachers, who demand a single salary schedule so that achievement cannot be rewarded; with students who take cinch courses. The land, from coast to coast," he said, "has been enjoying a stampede away from responsibility."

Conditions such as these are largely responsible for our "no-good goods," our cars that won't run, our air conditioners that won't cool, our dishwashers that won't clean, and the knobs of our gadgets that do nothing but fall off.

Perhaps we must take a longer look at some of our foreign competition in this regard. When one of your neighbors buys a small Mercedes Benz, is he getting a car that is not the equal of an American compact? Is his Patek Phillipe watch worse than a Hamilton? Is his Minox camera less than equal to a Kodak? Are all of the imports junk—or are some of them real competitors-competitors as regards to quality as well as price?

These questions must be answered not only at home but in the world markets as well. And these are truly times that demand decisions. I believe that it is about time that we reach a decision to roll up our shirt sleeves and compete.

Recently, I heard former Secretary of Labor Mitchell say—"For a corporation to make a profit and pay a divident is not enough—it must do something for the public good."

Our own corporation has quite a battle to make a profit in order to afford to do something for the public good. So far, we have managed to do both—make a profit and do something each year for the public good.

Secretary Mitchell also stated—"For Labor to get an increase in pay is not enough—Labor must do something for the public good."

In addition to Management and Labor there has been some recent mention of a third force in our economy, and a very important force this is indeed. The third force is the consumer who is ultimately the ruler of management and labor. This third force now frequently buys more imported goods than domestic management and labor working together can export.

The United States is currently an import nation.

Different sources claim import or export superiority depending on the season of the year. However, whenever we are not an import nation, we are close to being an import nation. This would indicate to me that the people who require high wages for making Chevrolets now too often drive Volkswagons. The very consumers who demand top rates for making Syracuse china are buying imported Japanese china. Many a consumer on the payroll of General Electric at top wages buys a transistor radio manufactured in Japan.

When we were children, we learned you cannot have your cake and eat it. It's a fundamental truth equally applicable for adults.

We cannot continually increase corporate profits, continually raise wages, continue to import more than we export and expect to successfully compete in world markets.

The 35-hour week, the three-cocktail lunch, the ten-paid-holiday year, the four week vacation, cannot successfully, for long, compete with the 80- to 100-hour work week existing in countries fighting for world markets, where the pay-off is a daily bowl of rice or one-twelfth the cost of a pair of shoes.

Neither tariff nor technology can bridge so wide a gap.

I advocate a shirtsleeve realism here which will be rewarded by more competitive effectiveness in the world's marketplace; more aggressive distribution of the needs of mankind; and more giant steps forward in creativity and productivity.

In spite of the threats and promises and shadows resulting from the recent political campaign, government can't solve all the problems, nor dispel the dilemma of the times. The problems of business and the need for expanding employment opportunities just won't go away by wishing.

Every businessman and working man has to face up to the sticky challenge that we must work harder . . . produce more and better . . . serve well and more graciously . . . create as well as we can . . . and market and sell with ingenuity at realistic cost . . . OR ELSE.

There are some other basic answers, of course:

1. There has to be a stabilization of prices consistent with technical developments of raw materials and finished products. In this respect, the chemical industry has been doing a fine job.

2. There has to be at least minimal protection from foreign imports which are truly bad in quality, cheap in price, and which by their very inefficiency discourage sales of similar-appearing domestically produced items.

3. There has to be a policy of no complacency on the part of American business regarding the real quality and value of many foreign-made items, and willingness to meet this competition.

4. Better communications to the consumer on export-import balance problems is vital.

5. A re-creation of the American business image in the eyes and minds of foreign nations is imperative.

From my personal observations while traveling outside the United States, I believe that true nature of the American personality is greatly misunderstood. People do not believe that we earn what we have and, therefore, we should always give everything away quite freely. We might try exporting the old-fashioned "Yankee trader" idea that in America we get nothing for nothing and we would prefer to give nothing for nothing.

6. I advocate more shirtsleeves and less stuffed shirts at home.

If someone were to offer you a way to increase your productivity and profitability without adding to your overhead (without getting help from the government and without increasing your investment), you would probably listen carefully to the proposed method. The rolled up shirtsleeves could accomplish these objectives with utmost simplicity if enough people were enthused with the idea.

Some of the younger executives exhibit the drive, the depth and diligence to their work that causes us to have hope for the future they will inherit.

A very hard-working young friend of mine in his mid-twenties, employed by one of the largest corporations, was discussing this very point with me recently. He said, "I like to think that Thomas Edison invented the electric light so that he could work after dark on other projects that were vital and important to him." Amen! Such sentiment, so seriously stated, gives us hope.

Earlier I referred to "the great American circus of competitive, productive, enterprise," I ask you to consider big and little business together as part of the same circus. We will succeed better working together.

Big business, I believe, can be likened to the owner of the circus who controls the ticket sales, the concessions and can make or break the performers. Because of size, ability, the staff and resources to carry on the enterprise, the circus operator is all-powerful. But he still has to rely on the attraction of the specialty acts to fill the tent.

And whether you buy the analogy or reject it, from the standpoint of the small business operator, there's more accuracy than theatre in the comparison. Small business serves as the specialty performers . . . like myself, a high wire act.

No matter how high the pay . . . there is little security. The aspects of illusion are, if anything, simpler —but more demanding of never-ending perfection. We're equipped with the works—the balancing pole, the spotlight, the music, the drum roll, but unfortunately no net!

As performers, we're always a little nervous—and this we must hide. We must always please the crowd in order to get another booking . . . and if we fall off the wire even once . . . it's too many times.

When you see a good little business, well-managed, you see an old-fashioned high wire act in the best tradition of America. The aerialists of the past were Mr. DuPont, Mr. Dow, Mr. Eastman, Mr. Firestone, Mr. Ford and Thomas Edison, among others . . . the parade of individualists whose names are synonomous with American enterprise, and whose rolled-up sleeves were the model for the image I want revived.

I don't want a legislated opportunity to perform. I want a chance to show what I can do on the wire. Yes, I want help up the ladder once in a while, but once in position I think my act will keep customers coming into the tent.

The rehearsals may have been long and hard, but as a still smiling, delicately balanced performer, I think I symbolize a genuine shirtsleeve image working and willing to work harder.

I say, "Hey Rube, let's work together . . . harder . . . and let's keep this wonderful circus of ours on the road."

—The End

Polypropylene monofilament extrusion

(Cont'd. from page 25)

Guide bars in the bath (Fig. 6) keep the filaments from crossing over one another and breaking down upon subsequent drawing. The first set of bars is located at the bottom of the bath directly below the die, and the second set is just below the level of the water where the filaments leave the bath. Upon emerging, and before traveling around the pull-out rolls, the monofilaments pass between air jets which blow off any remaining water (Fig. 7). From the pull-out rolls, the monofilaments enter the drafting oven from which they go to either the spindle windup or the relax oven. (Fig. 8).

Conclusion

The data presented here show that the tenacity of monofilament depends primarily upon the degree to which it is drafted. With sufficient drafting, high molecular weight polypropylene formulation produce monofilaments with a tenacity of 8G/D. This compares favorably with the 1.3 G/D, 4.0 G/D, and 9.0 G/D for wool, cotton, and nylon, respectively.

Inexpensive polypropylene monofilaments should find widespread use in applications such as lawn furniture webbing. For outdoor applications, polypropylene is stabilized against the effects of ultraviolet radiation from sunlight.

Glossary of terms

1. Denier—the weight in grams of 9,000 meters of yarn. The denier of polypropylene monofilament is approximately 4.14 as great as the square of its diameter expressed in mils.
2. Tenacity, G/D—the load required to break the filament expressed in grams per denier.
3. Elongation, %—the percent increase in original length at the break point in the tenacity test.
4. Hot-oven shrinkage—shrinkage of a measured length of filament after exposure in an oven at 125° C., for 10 minutes.
5. Uster evenness, % variation—the average total per cent variation in filament size along the length of the filament.

—The End

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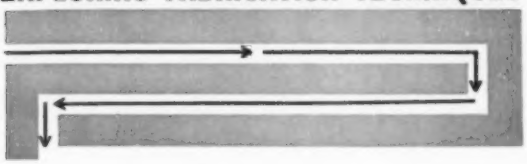


By L. J. ZUKOR, *ENGINEERING EDITOR*

Casting powdered resins

Rotational molding, so successful with vinyl plastisols, shows new promise in the casting of powdered materials — both vinyls and others. Since the Molitor patent describes only the rotational molding of vinyl dispersions (and does not refer to powdered materials), look for this process to recapture lost markets and invade new ones.

As the name implies, rotational molding consists of rotating a mold in two planes about axes perpendicular to each other. This motion presents a moving, changing face to the inert plastic material. When the mold is heated, resin particles contact its surface, melt, and fuse together — thus building up a thickness which follows the mold contours.

Materials and methods used in manufacturing the molds are the same, whether for plastisol or powder — electroformed copper, sprayed aluminum-zinc alloy, and cast aluminum alloy. When high precision molds are required, they can be made by any of the other acceptable mold making methods so long as the materials used have sufficiently high thermal conductivity.

Many of us saw the rotational molding of powdered resin at the U. S. Industrial Chemical Co.'s booth during the recent Plastics Exposition. At the booth, Ted Miller, president of Akron Presform Mold Co., demonstrated a single spindle model of his firm's rotational molding machine. The mechanism was mounted in a windowed, hot air oven for viewing the unit producing hollow flexible articles. Castings were made using 0.916 g/cm³ Microthene (USI polyethylene) resin. Other densities of polyethylene powders and other powdered resins can be used in this process.

Photo courtesy: The Akron Pressform Mold Co.

Six-spindle rotational casting unit showing drive mechanism and mold arrangement.

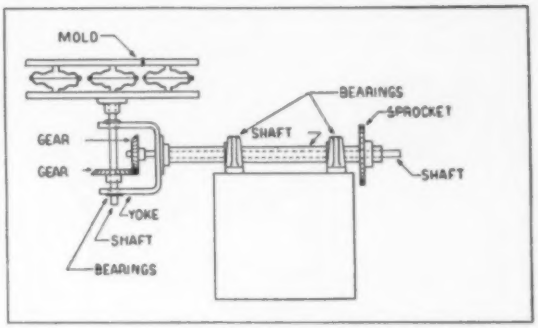


Diagram courtesy: The Akron Pressform Mold Co.

Typical drive mechanism.

Resin density (in polyethylene) determines the relative rigidity of the finished article.

One of the items produced was an inflatable football approximately 8 inches long and 4½ inches at its greatest diameter. It weighed 52 grams, and its molding parameters were as follows: time and speed of rotation, 12 min. at 8 rpm.; surrounding air temperature, 375-400° F.; mold temperature stabilized at 400° F.; mean stock temperature, about 380° F.; and wall thickness, about 0.050-inch. Heat losses through the glass windows reduced the oven temperature below its prescribed value. An estimated production rate for this item was 300/hour on a 6-spindle machine.

Comparing the above to a blow-molded football of similar dimensions, the latter weighs more (82 grams) and has a production rate of 240/hr. In addition, the blown football had an irregular wall thickness and

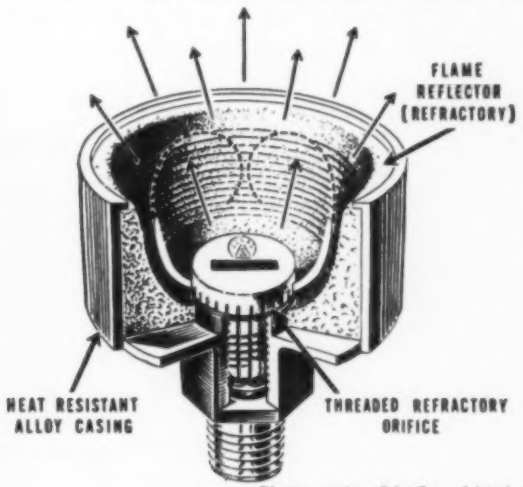


Diagram courtesy: Selas Corp. of America.

Radiant type air-gas burner used on Page machine. Heater rocks with the mold carriage at a constant distance from the mold.

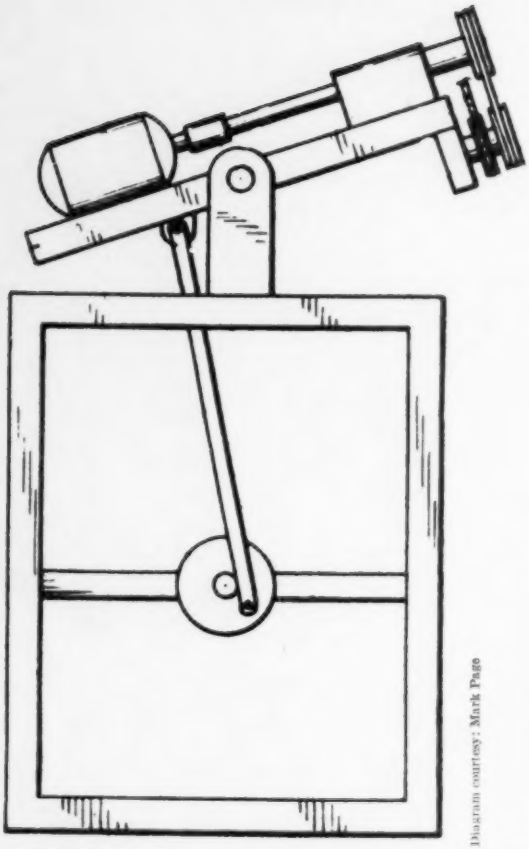


Diagram courtesy: Mark Page

Page drive mechanism for rotating and oscillating mold carriage.

the parison weighed about 110 grams. This means 35% scrap, which must be reground. Production losses ran about 2% due to incompletely blown items.

This would indicate clear advantages in favor of rotational molding; however, this is not always the case since configurations and type of product are the real criteria of choice. In the case of doll parts, though, rotational molding could regain some of the ground it lost to blow molding. Another area of preference would be one-piece (seamless), unbreakable aerosol bottles. Bottle manufacturers would do well to investigate this technique thoroughly.

Rotational molding offers the following advantages for casting hollow objects from powdered resins:

1. The weight of the finished article can be predetermined by the amount of powder loaded into a mold.

2. Contamination is reduced, since the mold is loaded and closed rather than charged repeatedly (Heisler or Engel processes).

3. Loss in scrap and trimmings is practically nil once the production run is established.

A wide variety of commercial equipment is available, all of which perform the basic functions of mold rotation and heating. Further, many manufacturers can be expected to offer automatic powder filling mechanisms.

An instance of the design differences is the machine developed by Mark Page, which he describes as a "rock and roll" unit. It differs from other designs by substituting an oscillating, rocking motion in place of a rotating motion. Reports from England, where machines are presently operating, claim high outputs plus ease of handling and maintenance for the Page unit. Another manufacturer, Mercury Molding Machinery Inc., has a machine designed on the rotating principle.

Another design difference is in the approach taken to the method of mold heating. The Akron Presform machines and the Mercury machines use air convection currents, whereas the Page uses radiant heaters of the

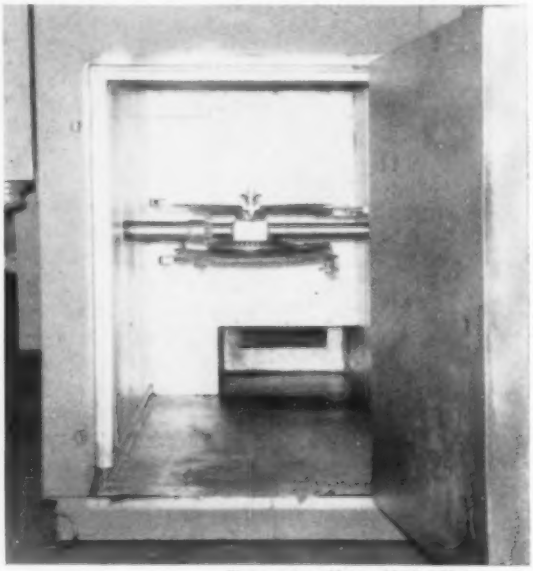


Photo courtesy: Mercury Molding Machinery Co.

View through side clean-out door of Roto-Molder shows drive mechanism and hot air duct.

gas-fired parabolic type. Immersion in a heated fluid and heating by dielectric and induction methods have also been used with some success.

Variable orifice gating

If you're an injection molder, there's no question but that you've been amply exposed to the screw injection method. Machines manufactured both here and abroad were in full array at the recent National Plastics Exposition. The American injection molder had his attention focused on screw injection almost three years ago, when Reed-Prentice exhibited its screw type injection machine in Chicago. Concurrent with that show, I reported on the Italian Fimsai unit then used in Europe. My own observation of the Fimsai unit was, that besides being an injection *head*, it could be used for extrusion, blow-molding, and high pressure potting operations. I envisioned heavy-section extruded shapes and pipe being produced on a modified screw injection machine. Here, melt pressures of 20,000 psi. (greater than those available in the fixed screw extruder) could be utilized advantageously.

For blow-molding, the screw injector can supply a built-in variable volume "accumulator" and certainly can push a parison out of a die in less time than it takes for rotary extrusion. For high pressure potting

and other closely related processes, a screw injection head could be moved into position adjacent to a compression press where it would shoot material into a closed mold via an opening along its parting line. Both thermoplastic and some thermosetting materials could be used.

From the preceding description, one can readily visualize that the screw injector mechanism is a separate machine element in its own right. Many of our readers, including those closely connected to injection molding, are not fully aware of the large number of changes taking place in their industry. Injection molding in recent years has undergone such evolutionary changes as valve gating, hot runners and other modifications of runner systems, and new instrumentation. These innovations have since been incorporated in the designs of injection molding machines. When the injector section and these other independent machine elements are tied together in sequence operation (generally on a common base), they form a modern automatic injection molding machine. Present mold clamping mechanisms seem well suited for their application, and are adaptable to all the modifications which have occurred in other sections of the machines.

Today, the idea of building a proven mechanism into a machine member rather than incorporating it into a mold is common practice. Yesterday's hot runner manifold is today's multiple nozzle manifold. Both pin point gating and valve gating are available as "built-ins" in injection machinery. This has promoted the use of these mechanisms, while creating savings in mold and tooling costs.

At the Exposition last month, I talked with Quentin White* who informed me about yet another technical contribution that his company had made to the injection molding industry. The technique he described was one in which the size of the gate orifice is varied from open to fully or partially closed.

* Product Mgr., Press Div., F. J. Stokes Corp., Philadelphia, Pa.

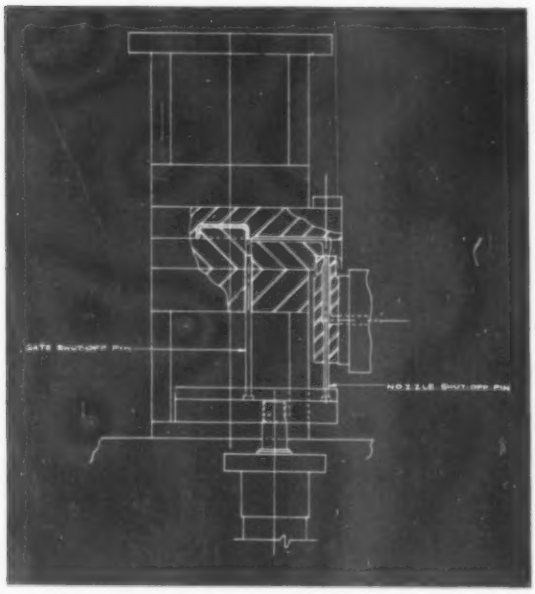


Diagram courtesy: F. J. Stokes Corp.

Gate-reduction pin arrangement—schematic.

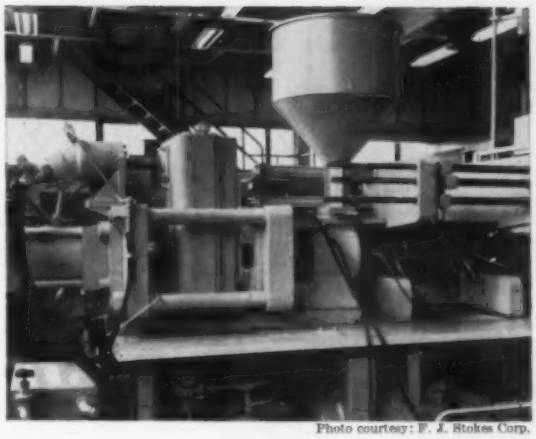


Photo courtesy: F. J. Stokes Corp.

Stokes 706 screw injection machine showing hydraulic motor used for screw rotation. A splined shaft connects the injection cylinder to the screw.

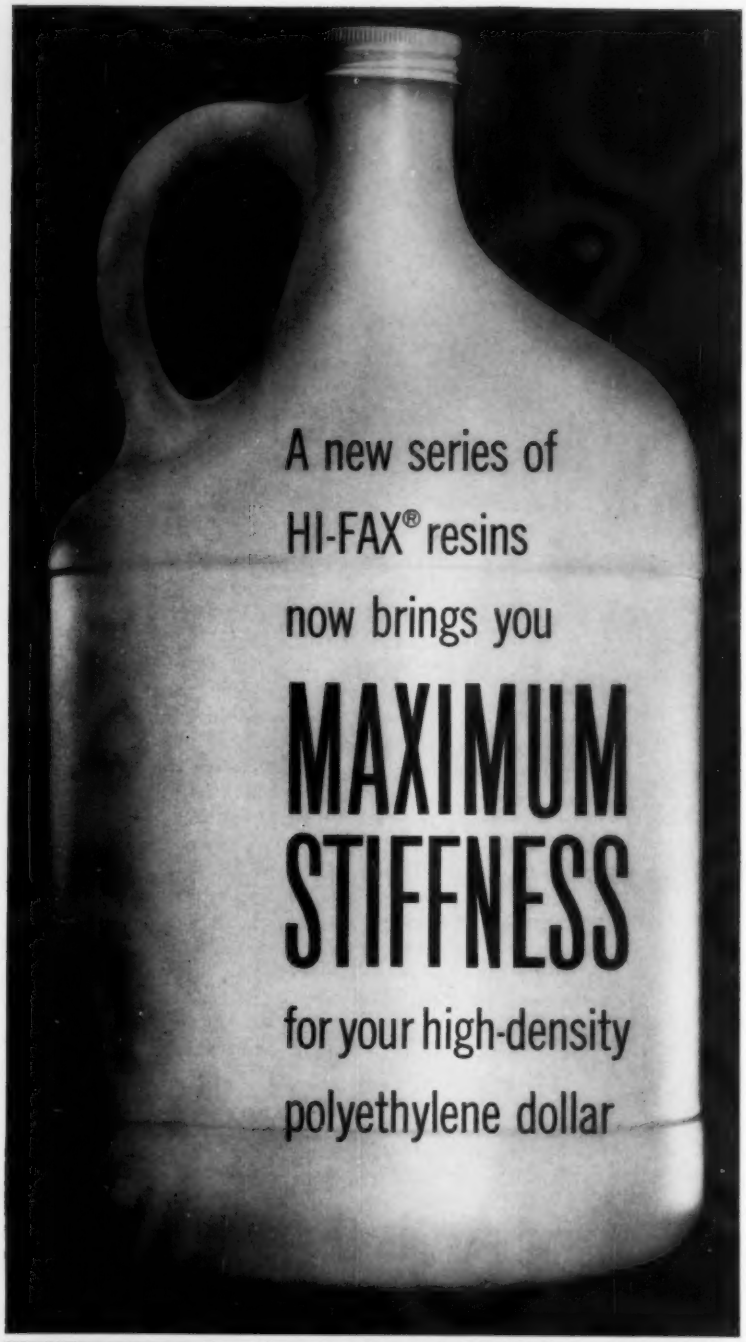
With all its simplicity, variable orifice gating is a major contribution to both automatic molding and the molding of polymers (such as polypropylene and nylon) which display sharp freeze points.

Large gates were required to obtain fast and complete filling of a mold. These left large runners or sprues to be trimmed after the plastic material had set-up. Trimming is mostly a manual operation entailing an added labor-cost per piece. Variable orifice gating eliminates the trimming operation. The Stokes solution has been to incorporate a simple gate-reduction pin into its group of injection machines, actuated by the same press motion simultaneously with the nozzle shut-off valve. Such a mechanism can also be built into a mold, and be actuated by a small air or hydraulic cylinder. In the latter case, its operation must be sequenced into the timing cycle of the injection machine for proper operation.

In the Stokes screw or plunger type injection molding presses, the nozzle shut-off valve and the gate reduction pin operate in unison. The shut-off valve remains closed long enough to build a pre-pack pressure in the injection cylinder. During the cycle, the shut-off valve and the gate reduction pin are retracted to provide a large opening for rapid admission of material to the cavity. Then, both pins are inserted automatically. The nozzle shut-off pin prevents back flow of material as the ram-pressure is reduced, and the gate reduction pin pinches off the material at the very edge of the molded part.

The gate reduction device has been applied to 0.100 - 0.375 inch diameter gates and could be applied to larger orifices. There is no maximum size limitation. It is equally effective with acrylic, styrene, and ABS materials. Variable orifice gating has been applied successfully by R. E. Dietz and Co. and Western Electric Co. — the former, in the molding of acrylic lenses for truck warning lamps, and the latter in the molding of ABS housings for the Princess telephone.

—The End



NEW 0.962 HI-FAX RESINS

Series	Melt Index
Hi-fax 2600 E	0.2
Hi-fax 2400 E	0.9
Hi-fax 2300 E	1.5

Hi-fax® is the Hercules Powder Company registered trade mark for high-density polyethylene.

Another first for Hi-fax: 0.962-density resins in three different melt indexes. Produced by the exclusive Hercules process with Ziegler catalysts, this new economy form of Hi-fax is the first material of its type commercially available in America. Check these outstanding features of this important addition to the Hi-fax family:

Maximum stiffness
Superior surface gloss
Sharper light transmission
Increased resistance to permeation
Low cost

Add to all this the established processing advantages exclusive with Hi-fax, and the door is opened to a whole new vista of profitable markets.

Liquid bleach packaging appears to be one of the largest potential markets for these new Hi-fax resins. With its high degree of stiffness and excellent resistance to permeation, 0.962-density Hi-fax is one of the few materials capable of handling this hard-to-package product. In toys, sporting goods, durable housewares, and containers for motor oil, waxes, and a variety of household and industrial chemicals, blow molders are already making use of its improved surface finish, translucency, and merchandising appeal.

The scope of this versatile new resin reaches beyond blow-molding markets to such fields as extruded monofilaments, rigid sheets for vacuum-forming, and injection molding . . . wherever its outstanding stiffness, impermeability, and attractive surface finish provide the product advantages you require.

Extensively tested both in the laboratory and the market place prior to its introduction, 0.962-density Hi-fax is available now in whatever quantities you require . . . from a single bag to a 100,000 lb. Dry-Flo car. Attractively priced, it brings you that extra plus in properties and processability that made Hi-fax the pioneer . . . and still the leader of high-density polyethylenes.

Get thoroughly acquainted with 0.962-density Hi-fax resins. Write for all the facts.

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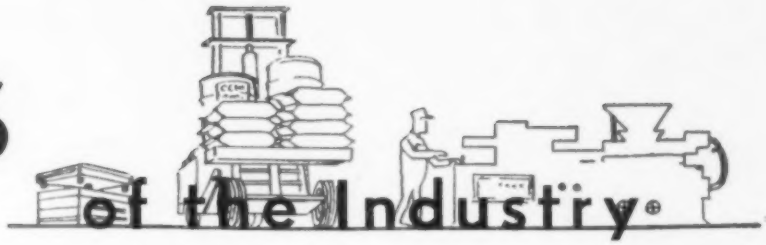
NEWS of the Industry



Union Carbide Europa has opened a technical service laboratory in Versoiz (Geneva), Switzerland.

Celanese Corp. of America has moved its New York City offices to 522 Fifth Ave.

Tronomatic Machine Mfg. Corp. has acquired Dynatech Products, Inc., together with exclusive license for a patent-pending process for the electronic high-frequency molding of expandable polystyrene. Tronomatic manufactures equipment for expanding styrene.

Allied Chemical's National Aniline Division has announced plans to construct a 15-million pound isocyanate plant in Southern California.

Technical Systems, Inc., Culver City, has purchased the assets of Mason Mold Corp., Covina, Calif. The latter firm had recently changed its name from Pasadena Electronics Corp.

Tufline Plastics, Inc., Milwaukee, has been organized to produce the line of products formerly made by Sunlite Plastics, Inc. Leslie F. Dimon, former Sunlite president, heads the new operation.

Cary Chemicals, Inc. has approved a $14-million expansion program which will include the construction of a 150-million pound per year PVC plant.

Laboratory For Electronics, Inc., and Tracerlab, Inc., have voted to merge, with LFE as the surviving company.

Vaterland-Werk, Neuenrade, Germany, has named Barnett J. Danson & Associates, Ltd., of Toronto as distributors for powder mixers in the United States and Canada.

Clark-Schwebel Fiber Glass Corp. has completed its $3½-million weaving and finishing plant in Anderson, S. C. Rovings will also be produced.

F. J. Stokes Corp. has appointed Walsh Associates of Seattle as its representative in the Northwest.

Schenectady Varnish Co. plans to build a full-scale phenol plant at Rotterdam Junction, N. Y.

Tonka Toys, Inc., recently purchased a plastics molding company in Mounds, Minn.—Empire Plastics, which became an operating division of Tonka.

Laramy Products Co., Cohasset, Mass., is now New England sales representative for Seiberling Rubber Co.'s plastics division.

Harte & Co., Inc., plan to erect a 44,000 square foot research center in Brooklyn. Occupancy is scheduled for the Spring of 1962.

Borg-Warner Corp. has acquired a controlling interest in Fibermold Corp., Gardena, Calif., for its Ingersoll-Humphreys division of Mansfield, O.

Spaulding Fibre Co., Inc., Tonawanda, N.Y., has opened a sales office in Springfield, Mass. Manager is Ralph A. Brown.

Rezolin, Inc., has moved to expanded facilities in Mt. Clemens, Mich. The 7,500 square foot plant features larger manufacturing facilities and an enlarged inventory.

Loma Industries, Inc., Forth Worth, Tex., has established a custom molding division headed by Robert Lambert, Jr.

Petro Plastics Co., Cranford, N.J. has announced the availability of a new tubular plastic line.

Mesa Plastics Co., Los Angeles, has announced the availability of parts and configurations molded of Diall (diallyl phthalate) for prototype testing.

Lunn Laminates, Inc., has taken over the assets of John Kaiser Associates, Wilmington, Del., manufacturer of reinforced plastics boats.

Wilson Brothers has acquired the rest of the stock of Parallite Mfg. Co., Export, Pa. Formerly a 50% owned affiliate, it now becomes a 100% subsidiary. Equipment and personnel will move to the Houze Glass plant in Point Marion, Pa.

Adamson United Co. has installed an automatic deep-hole drilling machine for circulating channels in platens. Service is said to be much faster and less expensive.

Freeman Chemical Corp., Port Washington, Wis., has announced the availability of a package system for urethane foam flotation.

H-P-M Division is the new designation for Hydraulic Press Mfg. Co., a division of Koehring Co.

Lermer Plastics, Inc., Garwood, N. J. has set up a division to manufacture flexible acetate containers.

Win-West Plastics, Inc. has been established in Libertyville, Ill., to mold small, precision thermoplastic parts. It is an affiliate of Winzeler Mfg. & Tool Co., Chicago.

AviSun Corp. has announced a price reduction to 64¢ per pound on all gages of Olefane (polypropylene) film in shipments of 500 pounds or more. In addition, AviSun introduced a 0.87 gage film which yields 35,400 square inches/pound—for a resulting price of 1.81 cents per square inch.

Kautex Machines, Inc., Linden, N. J., has appointed the Rainville Co., Inc., Garden City, N. Y. exclusive sales agent for the Kautex blow molding machines in the United States.

Names in the News

D. L. Duncan

Spencer Chemical Co. has announced five promotions in its plastics division. **D. L. Duncan** has taken the place of **Fred Sutro,** who resigned, as polyethylene product manager. Mr. Duncan, former manager of technical service and the Kansas City sales service laboratory, joined Spencer in 1957 as a salesman. He has been succeeded as manager of technical information and evaluation by **James Doti,** sales service laboratory supervisor. At the same time, **Glenn Tolle** became supervisor of technical service and **Sam Manci** became product improvement supervisor at the Orange works. Both men joined Spencer in 1952 as laboratory analysts. **S. P. Horkowitz,** formerly manager of technical service at Orange, has joined Spencer Chemical Co. International to serve as manager in the Far East.

As administrative vice president of Witco Chemical Co., Inc., **Rudolph Cubicciotti** will direct planning and coordination of all activities relevant to future corporate growth. Prior to assuming this position, Mr. Cubicciotti was vice president of Sonneborn Chemical & Refining Corp., a Witco subsidiary.

Peter Churm

Peter Churm, general manager of Fluorocarbon Co., has been named vice president. Before joining the company, he was superintendent of manufacturing control at Arcadia Metal Products.

Richard W. Reiter has been promoted to the position of laboratory manager of the resin development group, National Starch & Chemical Corp. Formerly responsible for product applications development in the resin research group, he will now also deal with the paint, coatings, and other resin markets.

Richard W. Arms, former product specialist for Garlock, Inc., plastic division of U.S. Gasket Co., has joined Danielson Mfg. Co. as extrusion products specialist. The Danielson, Conn., company molds and extrudes nylon.

Ray H. Mulford has been elected an executive vice president of Owens-Illinois Glass Co., of which he has been vice president since 1949. He will continue as president of the company's glass container division.

Robert P. Johnson, manager of the W. S. Shamban & Co. plant at Fort Wayne, Ind., has been designated a vice president. He will continue as plant manager, a position he has held for four years.

Henry P. Trounstine

Henry P. Trounstine, general manager of Clopay Corp.'s extruded products division since 1959, was elected a vice president. Until his promotion to general manager, he spent six years as sales manager of the division.

Howard S. Gunn, vice chairman of the board, Union Carbide Corp., has been elected chairman of the board of directors of the Manufacturing Chemists' Association, Inc., succeeding **R. C. McCurdy** of Shell Chemical Co. Also elected were **Robert B. Semple,** president, Wyandotte Chemicals Corp., chairman of the MCA executive committee; **Kerby H. Fisk,** chairman of the board, Allied Chemical Corp., and **Peter C. Allen,** president, Canadian Industries, Ltd., vice presidents.

Alfred C. Webber

Alfred C. Webber has been named chairman of the U. S. A. National Committee for the International Standards Organization's Technical Committee on Plastics. Assistant director of the research and development division for Du Pont's polychemicals department, he replaces **W. E. Brown** of Dow Chemical Co.

Ron Wallace

Ron Wallace, a former technician with Automatic Plastic Molding Co., has been promoted to production manager. As such, he is responsible for production, inventory, quality control, materials, and warehousing.

Carl Braastad now is production manager of Filon Plastics Corp., manufacturers of fiberglass reinforced panels. He was previously mill superintendent for Kalof Pulp & Paper Co.

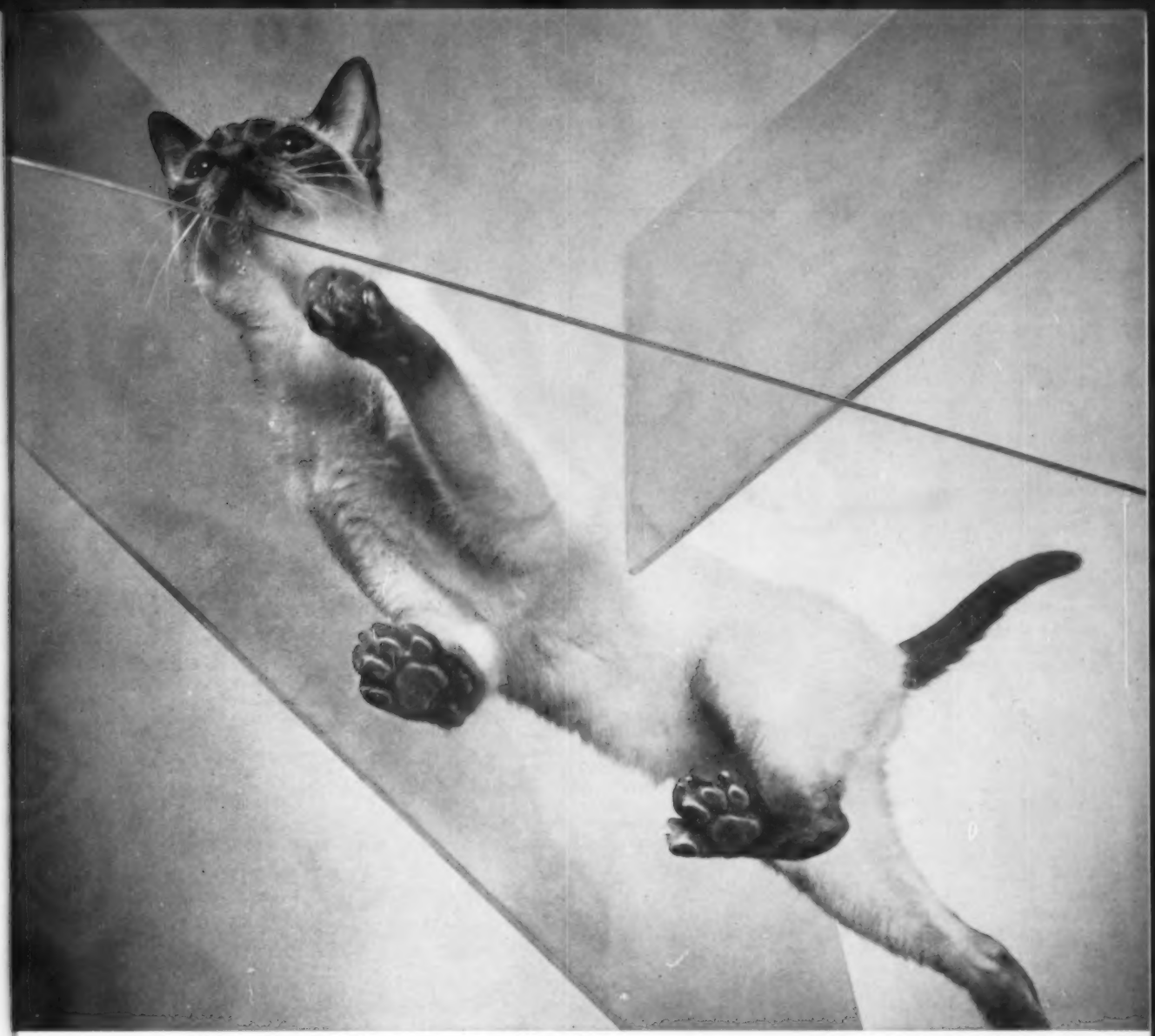
T. H. Johnston, Jr., has been named to the new post of director of manufacturing, Rogers Corp. After starting with the company as a salesman in 1940, he rose to be sales manager in 1952, and manager of two of the four Rogers divisions in 1958.

Joseph Bregger

Joseph Bregger will be responsible for design of mixing, palletizing, and extrusion equipment as chief engineer of Bonnot Co., Canton, O. Before joining Bonnot, he was project engineer with Durez Plastics Division, Hooker Chemical Co.

Chester Kotecki

Chester Kotecki has become vice president and general manager of Standard Molding & Cap Co. He will be in charge of design, construction, and production of several proprietary items the company intends to produce in its newly expanded plant.



Clearer Rigids?

Where the problem is to create clearer rigids—with excellent stability and at low cost—the answer is Mark 99.

This new Argus stabilizer supplies superior heat and light stability. It also eliminates the problems of cross-staining and offensive odor that occur when more costly tin mercaptide systems are used.

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Technical bulletins and samples on request

ARGUS CHEMICAL Corporation 633 Court Street, Brooklyn 31, N.Y. Branch: Frederick Building, Cleveland 15, Ohio

Rep's.: H. M. Royal, Inc., 11911 Woodruff Ave., Downey, Cal.; Philipp Bros. Chemicals, Inc., 10 High St., Boston; H. L. Blachford, Ltd., 977 Aqueduct St., Montreal. European Affiliates: SA Argus Chemical NV; 33, Rue d'Anderlecht, Drogenbos, Belgium—Lankro Chemicals, Ltd.; Salters Lane, Eccles, Manchester, England.

New Materials

For more information check Readers' Service Card (p. 75)

Styrene polyester resin

Naugatuck Chemical, division of U. S. Rubber Co., has developed a lightweight, high strength, promoted, styrene polyester for rapid room temperature laminating. Designated Vibrin 160-B, it is intended for fabrication of boats, structural panels, swimming pools, and similar items.

Among the characteristics of Vibrin 160-B are low specific gravity (1.045), high strength, fast wetting and curing, and ease of handling (requires merely addition of MEK peroxide catalyst before application to reinforcement). Properties of a laminate reinforced with #1000 glass fabric, 2 ounce mat, or 25 ounce roving follow.

Flexural strength, psi.	34,300
After 3 hour boil, psi.	32,150
Flexural modulus, psi.	1.2×10^6
Tensile strength, psi.	22,000
Compressive strength, psi.	15,600
Izod impact, notched, ft. lbs./in.	22

Readers' Service Item 1

Chemical-resistant material

Dayton Dayflex Plastics Co., division of Dayco Corp., has announced the development of a flexible plastic resistant to most chemicals and solvents. Developed to transmit percholoroethylene in liquid and vapor forms, the polymer is comparable in this respect to the more expensive rigid and semi-rigid solvent-resistant materials. The first commercial use for Dynaflex P-5932 was in a hose for dry cleaning machines.

The manufacturer will not reveal the chemical nature of the polymer, but reports that it will carry liquid and vaporous solvents at temperatures up to 175° F. While some organic solvents may cause swelling, they will not impair strength and impermeability.

Readers' Service Item 2

Polyethylene insulation

Union Carbide Plastics Co. has developed an exceptionally pure polyethylene compound noted for low-loss electrical properties. While Bakelite DFDA-0173 natural was specifically designed for primary insulation of transoceanic submarine telephone cable systems, it may also prove valuable in high voltage applications and other areas where critical control of properties is required.

The material is an unmodified, high molecular weight polyethylene containing only antioxidant. Thanks to technological developments, it was possible to increase stress crack resistance without addition of butyl rubber. This additive had previously been a source of contaminant particles, which can lead to breakdown of insulating properties at points of accumulation. Properties are held to narrow limits during extrusion. Despite a low melt index (less than 0.1), the company reports good extrudability.

Typical properties of DFDA-0173 natural are:

Density	0.923
Tensile strength, psi.	2,400
Yield strength, psi.	1,600
Ultimate elongation, %	600
Brittle temperature, °C.	<—45
Dissipation factor, 23° C., 10^3 to 10^6 cycles	0.00012
Dielectric constant, 23° C., 10^3 to 10^6 cycles	2.283

Readers' Service Item 3

Epoxy flexibilizer-hardener

Harchem division, Wallace & Tiernan, Inc., has introduced a linear polymeric anhydride that functions as a flexibilizer and curing agent for epoxy resins. Called Harcure A, it provides noteworthy thermal shock and high temperature electrical properties to cured epoxy systems. A light tan solid, it can be formulated with liquid or solid epoxy resins in a single component system with prolonged shelf life at room temperature. It melts between 75 and 82° C.; at the latter temperature, specific gravity is approximately 1.

Harcure A is especially recommended for three applications — in encapsulation and impregnation of transformers, coil windings, and electrical parts; in fluidizing powders; and as a flexibilizer for epoxy tapes and laminates.

Readers' Service Item 4

Heat-resistant acrylic copolymer

A new, water-white, transparent acrylic plastic, Bavick-11, with an unusual combination of properties and applications has been introduced commercially by J. T. Baker Chemical Co., Plastics Div. The material is reported to have excellent heat resistance up to 250°F., and to be especially resistant to alcohols, mineral acids, strong alkalies, aliphatic hydrocarbons, fatty and organic acids, essential oils and detergents. It is also relatively inert to boiling water and low pressure steam, is resistant to breakage, has excellent ultraviolet resistance, and superior optical properties.

Bavick-11 can be injection or compression molded, extruded, machined, polished, lacquered, painted, hot stamped, metallized, dip-dyed, cemented and solvent welded in conventional equipment. Transparent, translucent and opaque colors are available as specified.

Among the applications seen for the material are in the instrument industry, where many windows and light wedges have been molded; the appliance industry, particularly electric ranges, coffee makers, radios, and television sets; the automotive and optical fields; perfume containers; and for medical devices and drug sundries.

Some typical properties of Bavick-11 are as follows:

Heat distortion, 264 psi., °F.	244-252
Index of refraction	1.519
Specific gravity	1.16
Tensile strength, psi.	9,000
Flexural strength, psi., 77°F.	15,000
At 220°F.	5,000
Modulus of elasticity, psi., 77°F.	480,000
At 220°F.	215,000
Impact strength, notched Izod, ft. lbs./in., 77°F.	0.3
Rockwell hardness	M102-105
Linear thermal expansion coefficient, /°C.	5.37×10^{-5}
Dielectric constant, 10^3 cps	3.0
Dissipation factor, 10^3 cps	0.028
Dielectric strength, short time ⅛ in. thickness, volts/mil.	475
Water absorption, 24 hrs., 77° F., %	0.2
Water absorption, 24 hrs., 212°F., %	1.5
Flammability, in./min.	1.7
Light stability	Very good

Readers' Service Item 5

Colored polystyrene products

Internally colored polystyrene pellets, reported to provide more intense colors and better bonding than earlier available expandable beads, have been announced by Dow Chemical Co. Trademarked Pelaspan 101, the pellets are cylindrical rather than spherical.

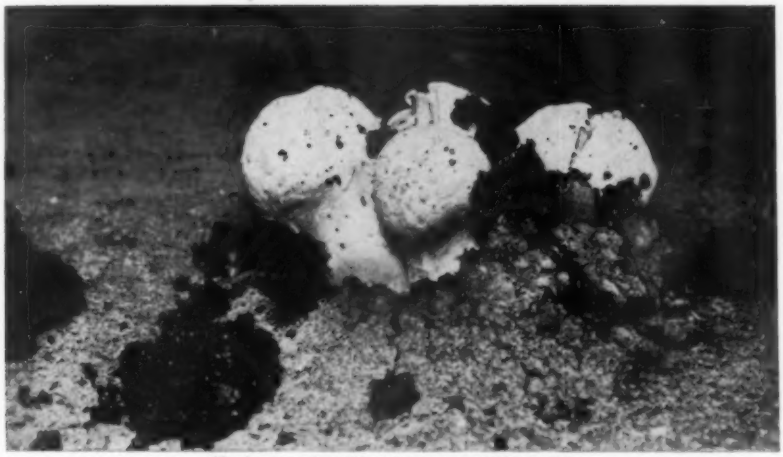
Coating the surface of a bead with pigment hinders the fusion of the beads in the mold. Since color is relative to density, only pastel shades could be easily achieved with dry blending. With the internally colored beads, dark, intense colors are possible.

The pellets are produced by a continuous process which insures greater uniformity in color and size. The pellets are 0.025 inch in diameter and 0.060 inch in length.

Readers' Service Item 6

For finishing expanded polystyrene products, Al-Chroma Paint Co. has developed a spray paint which will not dissolve foam plastics. Claimed to have the toughness and impact resistance of enamels, it can be furnished in any color, in a flat, semi-gloss, or gloss finish.

Readers' Service Item 7



Mushrooms breaking through asphalt paving

SPEAKING of BREAK-THROUGHS

Ankerwerk made such a breakthrough in injection technology five years ago by building the first successful reciprocating screw plasticizing machine and since then have placed many hundreds of machines in production throughout the world.

ADVANTAGES OF SCREW PLASTICIZING

- molding temperatures lowered 30-50°F
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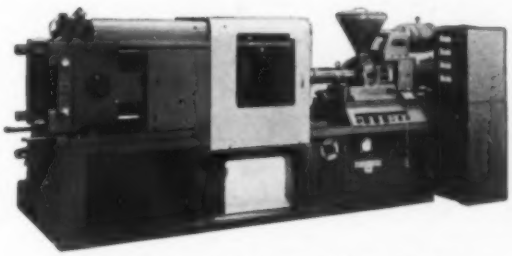
- molds filled faster with less differential shrinkage
- cycle time reduced up to 60%
- molding pressures reduced; fewer molded-in strains
- mold shrinkage reduced; molding to closer tolerances
- heat history shortened on heat-sensitive materials
- excellent color dispersions and rapid color changes
- optimum physical and chemical properties of polymer
- tested and proven by five years production experience



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ANKERWERK NÜRNBERG MODELS FROM 1.5 to 36 oz.

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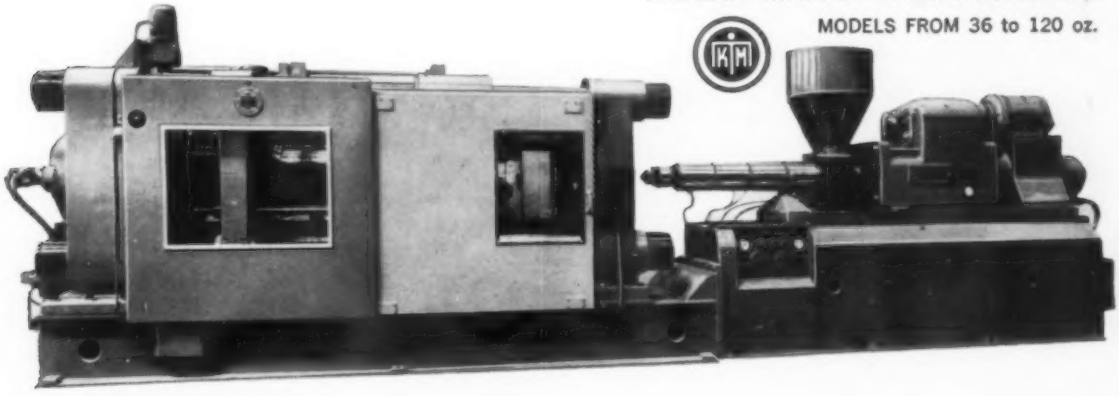

for complete information ask the leaders in screw-plasticizing machines

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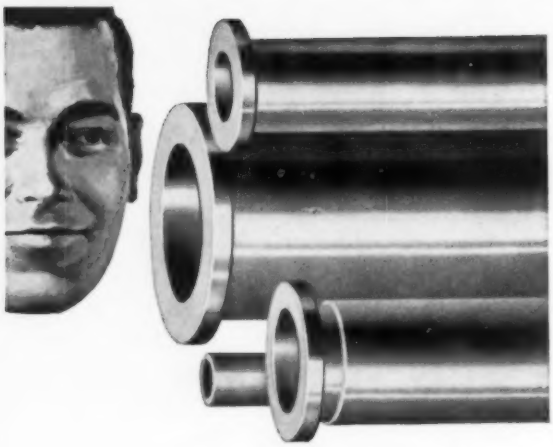

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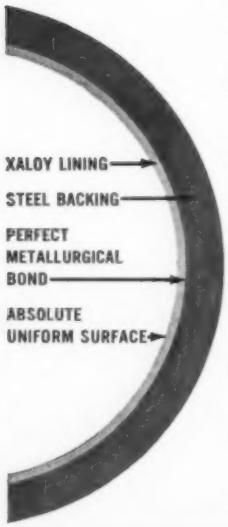

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Xaloy... the logical replacement for longest life

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INDUSTRIAL RESEARCH LABORATORIES
Division of Honolulu Oil Corp.
961 East Slauson Ave.
Los Angeles 11, Calif.

Epoxy casting resins

Maraset Resin 135E, an unfilled powder, and Maraset Resin 136E, a filled powder-single component, oven-cured, low exotherm epoxy casting powders are available from the Marblette Corp. Both resins allow excellent impregnation of electrical and electronic components and equipment and provide coatings with good toughness, adhesion, water and chemical resistance. The semiflexible coatings withstand severe mechanical and thermal shock and meet federal transformer specifications as per MIL-T-27A.

Characteristics shared by both powders include a four-hour pot life after being liquified, a 60% elongation rate, and low exotherm. Details of the properties of these powders, such as density, viscosity, tensile and impact strengths, hardness, dielectric strengths, and thermal conductivity are found in technical bulletins available from the company.

Readers' Service Item 8

Epoxized oil PVC plasticizer

Epoxol 9-5, a new improved epoxidized oil plasticizer with a minimum of 9% oxirane oxygen for PVC and other vinyl halide resins, has been announced by Swift & Co., technical products department. Specifications for Epoxol 9-5 show low viscosity, indicating low polymer content; and low infra red absorption, indicating low hydroxyl content. Iodine value is minimum, consistent with low by-products, and odor and flavor are minimum as well.

Tests indicate that the unique combination of compatibility and stabilizing efficiency of this epoxidized oil plasticizer will assist in solving the conflict between plasticizers with lower oxirane oxygen content where the use of increased concentration to achieve heat stability leads to spewing and reduced concentrations to avoid spewing result in decreased heat stability, by permitting the use of plasticizer concentrations that were previously impractical.

Readers' Service Item 9

Heat resistant polypropylene

Enjay Chemical Co. has announced a new Escon 125 LTHA (long term, heat-aging) molding grade of polypropylene which is especially recommended for applications in which molded parts are subjected to repetitive, long-term heat exposure. Escon 125 has a melting point of 335°F., a melt index of 5.5 at 230°F. Test specimens have withstood more than three months of oxidative aging at 300°F. and at 250°F. have shown no evidence of failure after more than six months.

Processing stability is excellent and no changes in either equipment settings or processing conditions from those used for general purpose molding grade Escon 105 are required.

Escon 125 is available in natural, but can be supplied in a variety of colors.

Readers' Service Item 10

Also Worth Mentioning—

☐ Goodyear Tire & Rubber Co. has tailored its Pliovic BL-80 for heavy gage vinyl chloride sheeting. The resin can be preblended and will absorb high amounts of plasticizers without heating. It shows outstanding freedom from gel particles and improved calendering properties.

Readers' Service Item 11

☐ The second formulation in a planned series of styrene/acrylonitrile copolymers, Tyril 780, has been announced by Dow Chemical Co. It is claimed to have higher levels of chemical resistance, heat resistance, and strength than similar copolymers.

Readers' Service Item 12

☐ A quinacridone pigment with a brilliant red-violet hue, Quindo Magenta RV-6803, is available from Harmon Colors, Allied Chemical's National Aniline division. It will give fiery red, pastel, iridescent, and yellow-toned colors when mixed with other pigments.

Readers' Service Item 13

☐ A high temperature, glass-reinforced phenolic intended for critical insulation and structural applications, has been developed by Rogers Corp. RX 600 offers superior electrical properties in the presence of moisture, and molds at extremely low pressure.

Readers' Service Item 14

☐ A primer for plastisols and organosols is reported to exhibit outstanding adhesion to metal and glass substrates. John L. Armitage & Co.'s P-289 may be sprayed or dip-coated and either air-flashed or baked.

Readers' Service Item 15

☐ Conductive inks for printed circuits have been developed by Advance Process Supply Co., Inc. Formulation EL-796 shows excellent adhesion on polystyrene, acrylic, and lacquered plastics. Resistance per square inch through 8XX mesh is 400 ohms.

Readers' Service Item 16

☐ A peroxide-stable, blue, organic die has been named Perox blue 2R by Patent Chemical, Inc. It is recommended for polyesters, and for transparent shades in polystyrene and other thermoplastics. The dye has good heat resistance and light fastness.

Readers' Service Item 17

☐ Three polyethylenes have been tailored by Phillips Chemical Co. Marlex TR-414 high density resin is recommended for pipe. Marlex TR-618 and TR-623 are economical low density resins designed for injection molding of toys and novelties.

Readers' Service Item 18

You're looking at the world's finest molding press . . . the 90-ton BIPEL Fully Automatic Compression Press . . . the ultimate in production and economy!

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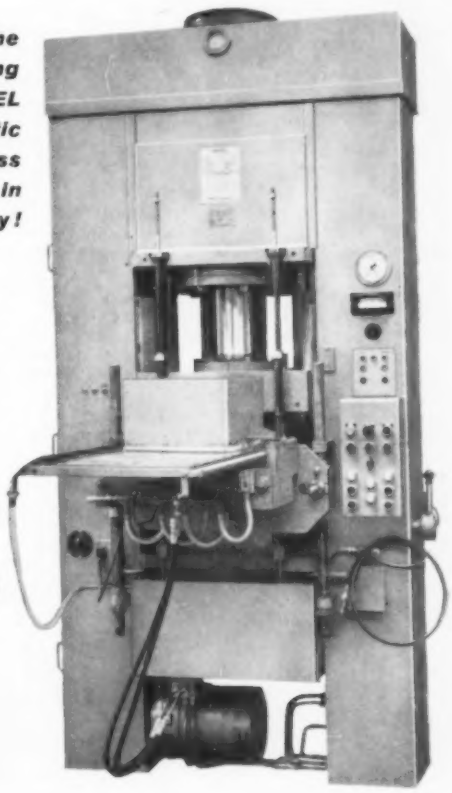
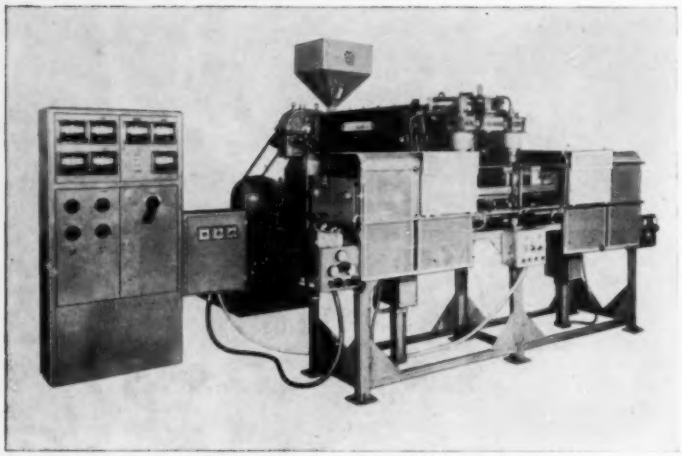


New Equipment



High production blow molding machine.

Meter-Master blow molding machines

The new Meter-Master blow molding machines of Auto-Blow Corp. combine fast toggle action with high pressure hydraulic accumulation in two-, four-, and eight-station models for products up to eight inches in diameter. The new machines can simultaneously mold different items.

The toggle presses consist of two pairs of independently operating platens. Combined pneumatic-mechanic action makes for fast operation and very high clamping pressure, permitting the use of long molds. The toggle action provides a self-cushioning closure which eliminates the possibility of mold damage. No cylinders are used between the inside platens. It is said that use of a short-coupled manifold, practically eliminates the possibility of material hang-up.

The Meter-Master's accumulator is actuated by a hydraulic device that provides constant high pressure without a pump. Accumulators are self-purging for fast color changes and are temperature controlled. Plastic from the continuously running extruder is diverted into the accumulator when the manifold valve is closed. When the valve opens for parison extrusion, the plastic, under high pressure, is forced out rapidly. This fast extrusion of the parison means that a more uniform temperature is maintained throughout it, extrusion temperature is lower, troublesome neck-down characteristics are eliminated, cooling time and open mold time are reduced, and surface finish is improved, according to the manufacturer.

Either side of the new machines may be used, thus permitting operation with only one mold and reducing or eliminating material waste for short runs. Molds may be changed on one side without shutting down the machine. Both sides are used with up to four molds per side for long production runs.

Readers' Service Item 22

High speed injection-molding machine

A modern, compact, high speed, 3¾-ounce injection molding machine has been introduced by Argyle Engineering Co. Bell Machinery Co., Inc. is the exclusive distributor. Said to be capable of handling up to 75 pounds of any kind of plastic an hour, the machine has an 8-inch stroke and a platen area of 14½ by 21 inches accommodating large deep molds as well as shallow ones. The toggle clamp reportedly has one of the fastest actions ever developed and the water cooled plunger maintains proper clearance between plunger and feeding bushing, thereby lessening the chance of galling and/or sticking of the plunger.

Among the many modern features of the Argyle 4-125 are feed control; hinged hopper shut-off; built-in water cooling lines; straight through opening for conveyor system; fuse breaks on all heater bands; cam-lock design of stationary platen; plug-in type cycle timers for easy replacement; and an improved base design which provides accessibility to entire Vickers pumping unit.

Readers' Service Item 21

Argyle 4-125 injection molding machine.

For more information check Readers' Service Card (p. 75)

Die protector

Die damage can be prevented by an electronic device which stops the application of clamping pressure when the mold is closing incorrectly. The malfunction detector, a product of Wintriss Controls, automatically stops the machine from applying pressure when protruding objects are lodged in the molds, when dies are misaligned, when tie rods and guide ways require lubrication, and when die pins tighten.

The unit consists of a control panel, a pressure sensor fastened to the die cylinder, and position sensors mounted on the mold. When hydraulic pressure exceeds the preset point for moving platens, the control stops and reverses the motion of the die piston and opens the mold. Then the sensors relay information about the malfunction to the control unit. Use of the instrument is reported to minimize die damage, down time, and production slowups.

Readers' Service Item 23

Two molding machines

Hydraulic Press Mfg. Co. has announced the development of a 300-ounce preplasticizing injection molding machine and a 100-ton transfer molding press.

According to the manufacturer, the combined operations of a three-story rotary material valve and an adjustable stop nut permit exceptionally high speed production of minimum weight parts on model 2500-P-300 injection molding machine. The system assures uniformity in shots. Some of the specifications are:

Clamp pressure, tons	2,500
Injection rate, cu. in./min.	6,500
Mold mounting area, maximum, in.	48 x 83½
Mold clamp stroke, in.	60
Daylight, in.	106
Without ejector box	120
Drive, hp	290
Floor space, feet	12 x 36

Readers' Service Item 24

H-P-M has also designed a 100-ton, upward acting, transfer molding press. Designed for a manufacturer of telephone equipment, the completely automatic press is equipped with a top-mounted transfer cylinder. Brief specifications follow.

Clamp stroke, maximum, in.	12
Platen dimensions, in.	36 x 26
Daylight, in.	30
Hydraulic ejector system, tons	10
Transfer cylinder force, adjustable, tons	18–25
Transfer ram stroke, in.	9

Readers' Service Item 25

Polyester film welder

Gulton Industries, Inc., has gone into commercial production of a ten-watt Glennite ultrasonic welder for spot welding foil and polyester film, including that which has been vacuum coated. It is mounted in a trunion on a heavy base, and operates pneumatically. Among accessories available are a micro-second timer and a binocular microscope.

Readers' Service Item 26

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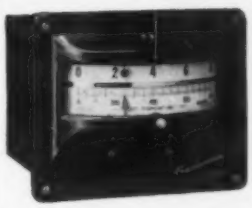

MODEL JP series provides *proportioning* heater control.

MODEL JPT-2 integrates control of *both* heating *and* cooling for frictional heat in extrusion.

MODEL JSB series provides *stepless* heater control within *extremely close* tolerance; especially appropriate for extrusion die or injection nozzle control.

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Plasticizing injection molder

The P-30-300 plasticizing injection molding machine, with shot capacity of 30 ounces, has been made available by Watson-Stillman Press division, Farrel-Birmingham Co., Inc. The internally heated torpedo in the heating cylinder assures maximum preplasticizing capacity. The machine is equipped with a water cooled injection bracket and plunger, controlled clamp and shooting speeds, and adjustable die opening speed. Nozzle shut off and positive stop can be supplied.

Clamping capacity, tons	300
Plasticizing capacity, lbs./hr., styrene	140
Die size, maximum, inches	20 ½ x 36
Daylight, inches	30
Clamp stroke, inches	18
Injection pressure on material, psi	20,000
Injection rate, cu. in./min.	1,090

The machine requires floor space measuring 16 feet 11 inches by 5 feet 6 inches. It is 6 feet 10 inches high.

Readers' Service Item 27

Temperature control panel

Thermocouples as long as 10,000 feet may be used for temperature indication and control with a transistorized instrument developed by Metronix, Inc. Model 600, a panel-mounting DC electronic voltmeter, operates on signals that become too small to actuate an ordinary pyrometer after they encounter the resistance of extremely long thermocouples. It has sufficient stability to eliminate operational zero adjustment.

Because it can be operated at long distance, the voltmeter can be placed on a centrally located panel with leads from several machines. When only indication is required, the instrument uses a single-pointer panel meter. When temperatures must also be controlled, model 600 incorporates a meter relay with contacts mounted on one or two additional pointers. Temperature may then be controlled at high or low limits, or both.

Input resistance is at least 100,000 ohms. Model 600 is available in eight standard temperatures ranges, from 0-300° F. to 0-3,000° F.

Readers' Service Item 28

Small shot dispenser

Automatic Process Control, Inc., has developed the Micro-Shot machine to permit metering, mixing, and dispensing small quantities of two-component resin systems. Since it will measure shots from less than 1 to 20 cc., it is particularly applicable for adhesive, casting, and potting jobs.

Micro-Shot can be operated automatically, will handle both filled and unfilled systems, and offers temperature control features on either resin or activator systems or both.

In operation, the machine is an electro-pneumatic device. Air pressure forces resin and activator components from separate pressure vessels through the feed lines to inlet valves on the metering cylinder cavities. A pivot mounted, ratio arm connected to the metering cylinder rods assures exact proportioning.

Pump and controls for degassing resin and vacuum casting are available as optional features.

Readers' Service Item 29

Also Worth Mentioning—

☐ Injection Molders Supply Co., Inc. has reported three new items. A 2-hp. mold chiller with an 18,850 BTU rating, uses alcohol type anti-freeze. It is portable and can be plugged in anywhere.

Readers' Service Item 30

☐ Stock heating cylinders for Reed-Prentice 10D8 machines feature a bolted front end for vinyl molding. Model P-31 heater also has increased plasticizing capacity.

Readers' Service Item 31

☐ The IMS vinyl degassing heater has been redesigned to fit the 450T Reed-Prentice 20-24 ounce press. Model number is P-30.

Readers' Service Item 32

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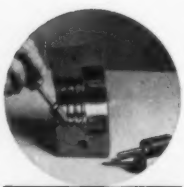

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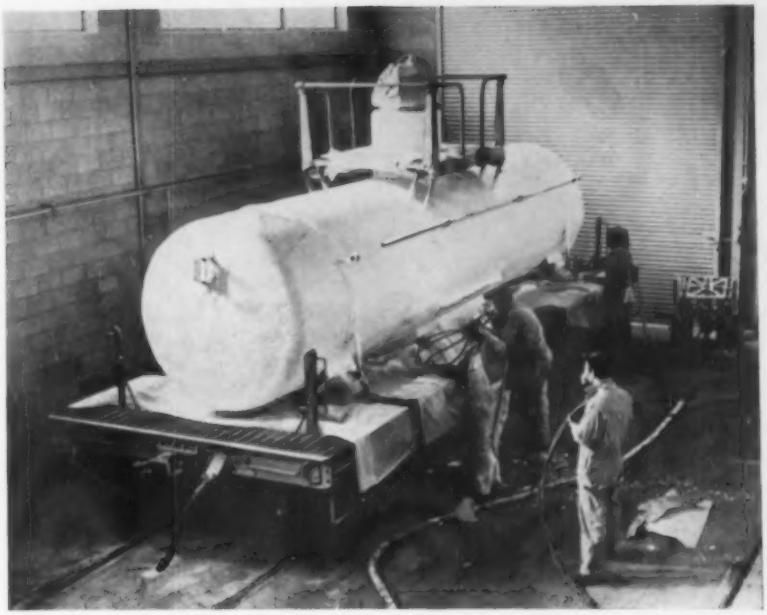
Plastics Applications



Foam jackets for tank cars

According to tests conducted by Allied Chemical Corp. on two of its nitrogen division's 4,000-gallon tank cars, rigid urethane foam is superior in insulating effectiveness to the insulation regularly used on railroad tank cars. The coatings under test consist of four-inch jackets of rigid foam blown with Genetron fluorocarbon gas, protected by 40-mil light gray coats of catalyzed polyester reinforced with chopped fiberglass roving.

The urethane foam jacket weighs one pound per square foot, in contrast to the six pound per square foot weight of conventional insulation and steel jacketing. Another big advantage of the foam is its ease of repair—in case of a wreck, the damaged foam could be cut away and resprayed.

Insulating Applicators, Inc., sprayed the jackets. The self-extinguishing foam was produced from urethane prepolymers manufactured by John H. Witte & Sons.

Readers' Service Item 41

Cored foam pillows

Perma-Foam, Inc., has introduced a urethane foam pillow consisting of two convoluted foam slabs hermetically sealed about an inner sheet of foam. The resultant pillows are reported to be extremely comfortable because of the air which is trapped within the cores. Made of Nopcofoam, the pillows have all the other advantages of urethane foam products as well.

Readers' Service Item 42

Supersonic tow target

A simulated aircraft target, designed for towing at supersonic speeds, has been built for the U. S. Navy Test Center at Johnsville, Pa. The body of the TA-6 target is molded of glass cloth impregnated with Dapon diallyl phthalate resin. Cordo Chemical Corp. supplied the Mobaloy D prepregs to Hayes Corp., who pressure-bag molded the body at 60 psi. The body is reported to provide unusual electrical-transparent properties essential to radar- and radio-controlled operation, help make safe recoveries possible, and resist critical supersonic temperatures.

Readers' Service Item 43

For more information check Readers' Service Card (p. 75)

DI-CUP® . . . *The Chemical Way to Cross-Link Polyethylene*

Di-cup, Hercules dicumyl peroxide, is a source of free radicals, which are highly effective in chemical cross-linking. It provides a simple, economical, and practical means of cross-linking low-density polyethylene.

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Implex nutcracker.

Screw nutcracker

A screw-operated nutcracker available from Teague Mfg. Co. will make the shelling of pecans, Brazil nuts, hazel nuts, and English walnuts simpler and neater. Except for the aluminum screw and cracking heads, the nutcracker consists of ivory Implex high impact acrylic, a product of Rohm & Haas Co. The threaded area which accommodates the metal screw reportedly resists wear and stripping as well as the screw.

Designed for the home, the unit is operated on a flat surface. The nut is inserted between the heads, and the vise closed. A transparent shield directs the broken shells downward, where they can be caught in a pan.

The nutcracker is molded for Teague by Intercontinental Plastics Mfg. Co.

Readers' Service Item 44

Blister Package Former

Plast-O-Craft Co., Inc., is manufacturing a vacuum former ideal for laboratory or short-run production of blisters. The manually-operated machine may be sheet or roll fed polyethylene, styrene, acetate, butyrate, and extruded acrylics.

The counterbalanced heater is easy to handle. Platen size of 15 by 20 inches is adequate to form 20 tooth brush blisters simultaneously. The machine has a timer which resets iteself at the completion of each cycle.

Readers' Service Item 45

Polyethylene Sieve Plates

Large diameter, sieve plates for fractionating towers used in chemical separation are molded from Ultra-Ethylux linear polyethylene, a product of Westlake Plastic Co Each plate, 36 inches in diameter and ¾ inch thick, has more than 7,000 precisely drilled holes varying from 3/16 1 3/16 inch in diameter. The holes are drilled with special non-burring equipment.

Readers' Service Item 46

Nylon swivel chair bearing

According to Collier-Keyworth Co., a nylon liner in the socket hub base of swivel chairs prolongs the life of chair action controls. The liner, a one-piece vertical thrust and vertical cantilever bearing surface for office chair base hubs, takes advantage of the low coefficient of friction of Du Pont's Zytel 101 resin, eliminating the need for lubrication of the center spindle. It also provides a tighter fit between chair base hub and the center spindle of the seat unit, assuring safe, steady operation.

The liners, developed with the help of the molder, Nylon Products Corp., is a rimmed tube held in position by a friction drive fit into the steel assembly. A molded-in, inverted "T" locking device fits into indexed perforations to prevent rotational or vertical movement.

One-piece liner for chair base hubs.
Readers' Service Item 47

Polyethylene ice cube tray

Dole Valve Co. has an ice tray used in both commercial ice making machines and home freezers.

Use of the commercial tray within the machine required that it have dry cube release properties requiring slight manipulation, and flexibility and long life under flexing at temperatures down to —20° F. The tray is effective because of the low ice adhesion properties of polyethylene, as well as the design. Each of the 12 cavities has a rounded bottom — only a 20° twist is required to have the cubes pop out.

The ice blue boxes are molded of Marlex high density polyethylene, a product of Phillips Chemical Co.

Readers' Service Item 48

Protect your product and machinery with the RCA ELECTRONIC METAL DETECTOR

Tramp metal is a threat that no plant can afford. So, today, hundreds of plants are using this special electronic equipment to safeguard their investment in costly equipment and product. Highly sensitive, it automatically detects all kinds of metal, both magnetic and non-magnetic. Inspects powdered, bulk, sheet or packaged materials.

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Also Worth Mentioning—

☐ A new formulation of Gay-Lon vinyl finish for interior floors and furniture has been announced by Seaboard Lacquer Co. Reported to be very durable, it dries in 15 minutes to a soft satin gloss. Gay-Lon may be applied with brush, roller, or spray directly over most old finishes.

Readers' Service Item 49

☐ Devcon Corp. has introduced an industrial aluminum-filled epoxy cement for repairing, filling, and building up castings, patterns, cores boxes, molds etc. The Devcon F Repair Kit contains a tube of epoxy with aluminum and a tube of semi-flexible hardener. About two hours after the materials are mixed in equal quantities and applied to the desired area, they will harden to a rigid mass containing 80% aluminum.

Readers' Service Item 50

☐ Formica doors provide long life and ease of maintenance in commercial and institutional installations. Delivered to the job ready to be hung, the door faces and stile edge are surfaced with Formica laminate. Eight standard flush types in all standard sizes up to 4 by 12 feet are available.

Readers' Service Item 51

☐ Four polyvinyl acetate wood ahesives are being marketed under the name Cascorez by Borden Chemical Co. The adhesives may be used for building, furniture, and assembly applications.

Readers' Service Item 52

☐ Vimo has introduced a luggage-like, reuseable package for merchandising dresses and other clothing. It is tailored of 12-gage clear vinyl with a three-ply matching handle. Two button snaps secure the flap closing.

Readers' Service Item 53

☐ Colorful Kradle Mates blocks are molded of Tenite polyethylene by Kusan, Inc. Sold in blister packages, the blocks can be tossed around or cuddled without danger of breaking or chipping.

Readers' Service Item 54

☐ The Plasti-Foam kit available from Polystructures, Inc., comes with all ingredients necessary to make one cubic foot of rigid, white, polyurethane foam. The foam, which can be placed in any mold, provides 60 pounds of flotation. It can be dry colored, tooled, and painted.

Readers' Service Item 55

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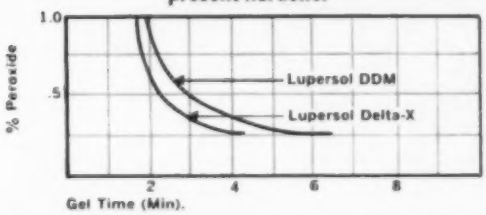

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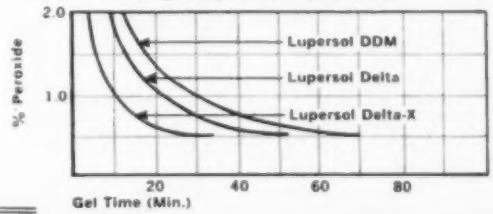

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New Literature

For more information check Readers' Service Card (p. 75)

"Your Product Can Be a Beautiful Show-off." SLM Plastics, 2 pages. Describes design and manufacturing facilities of this packaging company. Supplies illustrations and size ranges of typical acetate-cardboard, semi-rigid packages which can be specified.

Readers' Service Item 61

"Melt Flow Characteristics of Hercules Pro-Fax Polypropylene." Pro-fax No. 510. Hercules Powder Co. 2 pages. Describes six grades of material with different melt flows. Table of availability in stabilized systems. Recommended usage.

Readers' Service Item 62

"Gisholt Masterglas." Form 1181-B. Gisholt Plastics. 8 pages. Catalog of custom molded reinforced plastic products; design, engineering, and production facilities; and Delwood wood chip, fiberglass, and resin laminates.

Readers' Service Item 63

"Silicones for the Space Age." CDS-276. Silicone products department, General Electric Co. 15 pages. Discussion of silicone properties as they relate to applications in the aerospace industry. Covers materials for fabricating, encapsulating, dipping, impregnating, and coating. Also covers silicone dielectric and lubricating greases, paint additives, and water repellents.

Readers' Service Item 64

"Engineering Plastic Products." Bulletin 611. Polystructures, Inc. 4 pages. Describes facilities of the company to produce foamed and reinforced plastics with controlled properties. Includes typical applications.

Readers' Service Item 65

"Military Standards." MS28774, MS-28782, and MS28783. Tetrafluor, Inc. 4 pages. Reproductions of military standards for tetrafluoroethylene retainer gasket, packing backup, and packing retainer rings. Contain diagrams, specifications, dash numbers, and standard dimensions.

Readers' Service Item 66

"Rectangular Plastics Protectors." Bulletin P-6012. S. S. White Plastics division. 4 pages. Dimensions, weights, and prices of vinyl protectors for miniature electronic pin connectors are presented in this folder. Twelve sizes fit MIL C-8384 connectors, both flanged and unflanged.

Readers' Service Item 67

"Buyers' Guide to Silicone Spray and other Mold Releases." Injection Molders Supply Co., Inc. 16 pages. Lists all IMS agents including silicone type greases and rust preventives. Information on where and where not to use silicones and other release agents.

Readers' Service Item 68

"Tenite Cellulosic Plastics." Eastman Chemical Products, Inc. 8 pages. Summarizes and compares characteristics of acetate, butyrate, and propionate with respect to range of usage.

Readers' Service Item 69

"Grade GEC-5003 Laminate." Technical Data Bulletin 51.5.15. Taylor Fibre Co. 2 pages. Specifications, characteristics, tolerances, and electrical properties of a copper-clad glass-epoxy laminate with low moisture absorption, good chemical resistance, and high strength.

Readers' Service Item 70

"Glasdramatics." Polygon Plastic Co. 2 pages. Fiberglass-reinforced epoxy or polyester can be formulated in rod, tubing, or custom shapes to meet customer's strength, dielectric, and temperature requirements.

Readers' Service Item 71

"Beta Thickness Gages." Bulletin BG. Ohmart Corp. 2 pages. Specification sheet supplies information on method of operation, equipment, ranges, and mechanical and electrical data for Models BKR, BSR, and BMS thickness gages. Used for continuous measurement of sheet material thickness.

Readers' Service Item 72

"Vibratory Feeders." Syntron Co. 46 pages. Descriptions, data and specifications, and illustrations for the line of small, heavy, and extra-heavy duty standard electromagnetically vibrated feeders. Also covers such other products as spreader feeders, picking tables, and vibratory conveyors.

Readers' Service Item 73

"Storage and Handling of 2-Nitropropane." NP TDS No. 7. Commercial Solvents Corp. 4 pages. Construction and materials of storage tanks, pumps and piping, chemical activity, and toxicity of this organic solvent are detailed.

Readers' Service Item 74

"Aroclor Plasticizers." Technical Bulletin No. PL-306. Organic chemicals division, Monsanto Chemical Co. 49 pages. Specifications and physical characteristics of these inert, chlorinated biphenyls and polyphenyls. Data on applications in vinyls, polyesters, epoxies, and other resins.

Readers' Service Item 75

"Epoxy Casting and Adhesive Resins of Adjustable Flexibility." Isochem Resins Co. 2 pages. Use of three hardeners, each of which provides different flexibility, heat resistance, and strength of bond, is explained. Typical properties of cured flexible systems are listed.

Readers' Service Item 76

"Reference Manual on Automatic Weight Sensing." Form 3513. Exact Weight Scale Co. 8 pages. How measurement of weight or force is applied for automatic control is outlined, along with types of weigh systems and their control and operation.

Readers' Service Item 77

"Catalog of National Standard Abrasive Belts, Rolls, Sheets and Discs." Carborundum Co. 50 pages. Lists standard coated abrasive products used throughout industry. Tables list size, grading, commodity, use classification, and prices.

Readers' Service Item 78

"Plexiglas in Architecture." AIA File #24. PL-446. Rohm & Haas Co. 20 pages. Use of acrylic in lighting, facades, signs, art treatments, etc. Drawings and illustrations of various installations and applications. Properties and characteristics of sheet Plexiglas.

Readers' Service Item 79

"Compression and Transfer Molding Machines." Bulletin 640-D. Farrel-Birmingham Co., Inc., Watson-Stillman Press division. 6 pages. Complete specifications on machines from 50-1200 tons. Outstanding design and operating features are described.

Readers' Service Item 80

"Bakelite Vinyl Resins for Plastisols and Organosols." Union Carbide Plastics Co. 22 pages. Formulations, preparation, and flow properties of plastisols. Preparation of organosols. Applications and techniques for applying vinyl dispersions.

Readers' Service Item 81

Book Reviews

"Progress in Plastics — 1959." Phillip Morgan, Editor. Macmillan Co., 60 Fifth Ave., New York 11, N. Y. Cloth, 6¼ by 9¾ inches, 216 pages. $12.00.

This book contains the papers presented at the International Plastics Exhibition, Olympia, London, July 17-27, 1959. Besides including the papers in more detail than the original presentation, the book also includes discussions which followed each section. Non-technical papers on design have been omitted.

In the materials category, the book features papers on polypropylene, new epoxide resin systems, crosslinking of thermoplastics, theoretical and experimental aspects of block and graft copolymers, and progress in glass reinforced plastics in the Benelux countries, Germany, the U.K., and the U.S.A. Developments in foamed smokes and expanded polystyrene are covered under the topic expanded plastics. Finally, extrusion studies on thermoplastics and techniques of extruding acrylics are detailed.

"Crushing and Grinding." W. H. Bickle, Compiler. Chemical Publishing Co., Inc., 212 Fifth Ave., New York, N. Y. Cloth, 6 by 9¼ inches, 425 pages. $10.50.

This bibliography consists of about 2,800 literature references, most of which are abstracted or annotated.

It covers the entire area of crushing and grinding, but emphasis is not on plastics. Several references to literature on plastics occur, but there is no complete section on this branch of industry.

Plastics personnel may find the general articles on crushing and grinding practice, particle size determination, classification, and dust and fire hazards helpful, as well as the few specific plastics items.

"British Plastics Year Book—1961." *British Plastics.* Iliffe Books, Ltd., Dorset House, Stamford St., London S.E.1, England. Cloth, 6¼ by 9¼ inches. 712 pages. $6.30 (plus $0.28 postage).

The primary addition to the 31st edition of this annual yearbook is a section on services. This listing provides names of molders, fabricators, and processors by process used; type of material processed; and, in some cases, by end product, e.g., boat sheathing. It also includes reference to companies which supply such services as welding, hobbing, and vacuum coating.

Like earlier editions, this one features sections on materials, manufactured products, plant and equipment suppliers, trade names, names and addresses in the U.K. and overseas, who's who, and technical data. For easy reference, each division is prefaced by a tabbed card.

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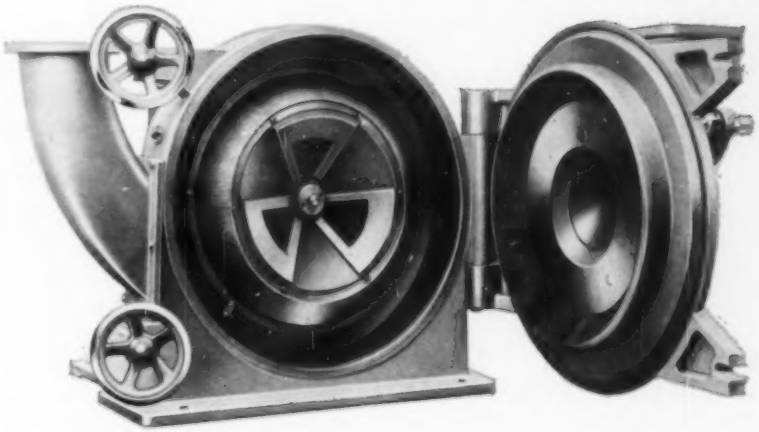

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Patent Digest

Materials

Continuous Process for Production of a Polyethylene Terephthalate Condensate. No. 2,973,341. W. Hippe, Erlenbach (Main), A. Watzl, Kleinwallstadt (Main), and W. Hagen, Aschaffenburg, Germany to Verinigte Glanzstoff-Fabriken AG., Wuppertal-Elberfeld, Germany).

Oxyalkylated Phenol-Aldehyde Resin. No. 2,973,340. E. N. Case, Homewood, Ill. (to Sinclair Refining Co., New York, N.Y.).

Method for Producing High Crystalline 1-Olefin Polymers of Decreased Flammability by Treatment with Nitric Acid and Resulting Products. No. 2,973,241. J. N. Scott, Jr., and R. V. Jones, Bartlesville, Okla. (to Phillips Petroleum Co.).

Chlorosulfonation of Ethylene Polymers. No. 2,972,604. W. B. Reynolds and P. J. Canterino, Bartlesville, Okla. (to Phillips Petroleum Co.).

Plasticized Resin Compositions. No. 2,972,589. R. Steckler, Russell, O. (to Food Machinery and Chemical Corp., New York, N.Y.).

Process of Coating a Polymeric Thermoplastic Dielectric Film and Resulting Article. No. 2,973,287. R. T. McBridge, Buffalo, N. Y. (to E. I. du Pont de Nemours & Co., Wilmington, Del.).

Organic Plastic Destaticized with Strontium-90, Method of Making and Laminate Containing Same. No. 2,973,292. W. H. Yanko, S. Steingiser, and I. O. Salyer, Dayton, O. (to Monsanto Chemical Co., St. Louis, Mo.).

Polyurethane Polymer. No. 2,973,333. M. Katz, Stillwater, Okla. and E. L. Wittbecker, W. Chester, Pa. (to E. I. du Pont de Nemours & Co., Wilmington, Del.).

Nickel Phenolate Stabilized Polypropylene. No. 2,971,940. **Nickel Bis-(p-Octylphenol) Monosulphide Stabilized Polyethylene.** No. 2,971,941. C. H. Fuchsman, Cleveland Heights, A. M. Nicholson, Warrensville Heights, and S. B. Elliott, Bedford, O. (to Ferro Corp., Cleveland, O.).

Anti-Static Molding Resins. No. 2,971,947. V. D. Floria and F. E. Towsley, Midland, Mich. (to Dow Chemical Co., Midland, Mich.).

Nylon Coating Method. No. 2,972,553. P. S. Hess, W. Orange, N. J. (to General Plastics Corp., Passaic, N. J.).

Process for Reinforcing Polytetrafluoroethylene Resin. No. 2,971,908. F. R. Chaffin, Los Angeles, Calif. (to W. S. Shamban & Co., Culver City, Calif.).

Epoxide Resins. No. 2,971,942. J. E. Masters and H. G. Cooke, Jr., Louisville, Ky. (to Devoe & Reynolds Co., Inc., Louisville, Ky.).

Process for Preparing Copolymers of Vinyl Chloride. No. 2,971,948. G. Messwarb, Kelkheim (Taunus), and W. Denk and H. Scherr, Frankfurt am Main, Germany (to Farbwerke Hoechst AG, Frankfurt am Main, Germany).

Low Vapor Permeable Composition of a Polystyrene and Naphthalene-Formaldehyde Resin and Method of Preparation. No. 2,973,338. H. A. Gottschall, 30S. Spring Garden Ave., Nutley, N. J.

Maleimide Polymers. No. 2,971,944. S. -W. Chow, Montclair, and J. M. Whelan, Jr., Murray Hill, N.J. (to Union Carbide Corp.).

Heat-Hardening Plastic Composition. No. 2,971,933. C. L. Beal, 42 Kendrick Lane, Huntington Station, N. Y.

Propylene Polymerization. No. 2,976,261. S. R. Lippincott, Springfield, R. M. Thomas, Westfield, H. T. Oakly, Elizabeth, R. F. Leary, Cranford, and R. S. Brodkey, Roselle, N J. (to Esso Research and Engineering Co.).

Method of Plasticizing Polyacrylonitrile with a Base-Initiated Copolymer of Acrylonitrile and Acrylamide. No. 2,974,119. W. H. Schuller, Stamford, and D. C. Guth, Norwalk, Conn. (to American Cyanamid Co., New York, N. Y.).

Molding Material Comprising a Polyamide and a Nitrile of a Higher Fatty Acid, and Process of Making. No. 2,976,258. J. L. Voigt, Arnhem, Netherlands (to N. V. Onderzoekingsinstituut Research, Arnhem, Netherlands.).

Printed copies of patents are available from the Commissioner of Patents, Washington 25, D. C. Prices, 25c each.
—The Editor

Process for Preparing Homogeneous Copolymers of a Vinylidene Monomer and a Maleic Monomer and Product Thereof. No. 2,971,939. M. Baer, Longmeadow, Mass. (to Monsanto Chemical Co., St. Louis, Mo.).

Composite Tapes, No. 2,974,063. W. J. Bobear, Latham, and K. W. Krantz, Schenectady, N. Y. (to General Electric Co.).

Removal of Olefin Polymers from Solution. No. 2,974,131. N. F. McLeod, Bartlesville, Okla. (to Phillips Petroleum Co.).

Purification of Polyethylene with Alkylene Oxides. No. 2,974,132. B. Jacobi and O. Wolff, Marl, Kreis Recklinghausen, Germany (to Chemische Werke Huls AG., Marl, Kreis Recklinghausen, Germany).

Method of Making Plastic Pellets. No. 2,974,135. E. A. Andrew, Berkeley, No. (to Olin Mathieson Chemical Corp., E. Alton, Ill.)

Process for the Production of Polymerization Products of Vinyl Chloride. No. 2,975,162. A. Hoff, Schkopau uber Merseburg, Germany (to VEB Chemische Werke Buna, Schkopau, Germany).

Polymerization Process and Apparatus for Use Therein. No. 2,975,165. A. N. Bolstad, Maplewood, N. J. (to Minnesota Mining and Mfg. Co., St. Paul, Minn.).

Polymerization Inhibitor. No. 2,975,221. M. L. Owens, Jr., Texas City, Tex. (to Monsanto Chemical Co., St. Louis, Mo.).

Film Forming Composition Containing Polyvinylacetate and Polyvinyl Isobutyl Ether. No. 2,974,114. R. Steckler, Chagrin Falls, O. and F. J. Prescott, Flushing, N. Y. (to General Aniline & Film Corp., New York, N. Y.).

Process for the Production of Polymers. No. 2,974,118. G. Nischk, Leverkusen, Germany (to Farbenfabriken Bayer AG., Leverkusen, Germany).

Coating Compositions and Methods. No. 2,974,121. G. A. Salensky, Metuchen, N. J. (to A. Gusmer, Inc., Hoboken, N. J.).

Patent Digest (Cont'd.)

Making High Linear Polyester with Magnesium Hypophosphite Catalyst. No. 2,974,122. J. Lincoln, B. J. Hawthorne, and E. J. Kowolik, Putteridge Bury, near Luton, England (to British Celanese Ltd.).

Process for Preparing Acrylonitrile Polymers. No. 2,974,123. C. C. Ketterer, Waynesboro, Va. (to E. I. du Pont de Nemours & Co., Wilmington, Del.).

Resins from Unsaturated Acetals. No. 2,974,127. **Novel Acetals and Resins Therefrom.** No. 2,974,128. D. E. Hudgin, Summit, N. J. (to Celanese Corp. of America, N. Y., N. Y.).

Process for Preparing Polyvinyl Chloride Useful in Plastisols. No. 2,974,129. A. R. Nelson, Bay City, and E. M. Jankowiak, Midland, Mich. (to Dow Chemical Co., Midland, Mich.).

Equipment

Apparatus for Shaping Plastic Articles. No. 2,974,361. F. Gercke, Morris Plains, and R. L. Hubbard, Florham Park, N. J., and C. Ferrara, Landisville, Pa. (to Warner-Lambert Pharmaceutical Co., Morris Plains, N. J.).

Apparatus for Testing Resin Coated Metal Sheets. No. 2,971,374. G. H. Rendel, Pittsburgh, Pa. (to U. S. Steel Corp.).

Clamping Mechanism for Molding Machines. No. 2,969,818. H. M. Allard, Nashua, N. H. (to Improved Machinery Inc., Nashua, N.H.).

Plastic Working Process and Apparatus. No. 2,969,563. J. W. Hendry, Louisville, Ky. (to Tube Turns Plastics, Inc., Louisville, Ky.).

Mixing and Thickening Machine for Extrusion. No. 2,972,168. I. Pastorello, Via Breda 118, Milan, Italy.

Apparatus for Molding Hollow Articles of Plastic. No. 2,974,362. E. R. Knowles, Fairfield, Conn. (to Specialty Papers Co., Dayton, O.).

Mixers for Plastic Materials with Liquid Discharge Means. No. 2,972,774. D. W. MacLeod, Ansonia, Conn. (to Farrel-Birmingham, Inc., Ansonia, Conn.).

Apparatus for Forming Sheet Material. No. 2,972,775. R. P. Baillie, Forward Twp., Butler Co., and W. H. Smith, Evansburg Borough, Pa. (to Demmler and Schenck Co., Evans City, Pa.).

Moulding Apparatus. No. 2,972,776. J. C. Siegrist, Case Postale 50, Delemont, Jura Bernois, Switzerland (to G. Ceppi, Bassecourt, Jura Bernois, Switzerland).

Mat Mold Having a Special Insert. No. 2,972,778. L. Wikkerink, Milwaukee 15, Wis. (to G. W. Houlsby, Jr., Chicago, Ill.).

Device for Laminating Plastic Sheets. No. 2,967,562. D. W. Orchard, Mentor, O. (to W. L. Gray & Co., Cleveland, O.).

Method and Apparatus for Blister Packaging. No. 2,970,414. H. A. Rohdin, 397 Forest Ave., Glen Ridge, N. J.

Mixing Apparatus. No. 2,970,817. J. F. Gurley, Jr., Pittsburgh, Pa. (to Mobay Chemical Co., Pittsburgh, Pa.).

Mixing Apparatus. No. 2,970,818. S. P. Kish, Lansing, J. W. Donnell, E. Lansing, and D. M. Graves, Lansing, Mich. (to Kish Industries, Inc., Lansing, Mich.).

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Article Abstracts

Materials

"The Graft Polymerization of Styrene on to Pre-Irradiated Polythene," T. T. Jones, BRIT. PLASTICS, 33, 11, 525 (Nov. 1960).

A study showing that degree of grafting is easily controlled by dose and time of aging after irradiation, while degree of polymerization is determined by time and temperature of polymerization.

"The Endurance of Polythene under Constant Tension While Immersed in Igepal," W. A. Dukes, BRIT. PLASTICS 34, 3, 123 (March 1961).

Conclusions are drawn on the influence of temperature, melt index, and density.

"Long Term Burst Testing for Plastics Pipe," D. A. Gill, BRIT. PLASTICS, 34, 3, 126 (March 1961).

Predictions are made on this test and its equipment.

"Dynamic Mechanical Testing of Polymers—Part 1," G. C. Karas and B. Warburton, BRIT. PLASTICS, 34, 3, 131 (March 1961).

The first part of a survey on the subject and the fundamentals of non-destructive dynamic mechanical testing.

"Synthetic Resins in Corrugated Paperboard," P. W. Sherwood, PLASTICS (LONDON), 26, 281, 111 (March 1961).

A brief review showing that the use of synthetic polymers in corrugated paperboard is still in its infancy.

"The Gelation of PVC," M. Roussos and Y. Bourgeois, PENSEZ PLASTIQUES, 7, 214, 5 (Oct. 1960).

The Ehlers and Goldstein method of determining the gelation power of plasticizers by determining gelation point from variations in viscosity in relation to temperature of a suspension of 1% of the polymer in a given plasticizer, was tested on different types of Afcovyl PVC plasticized with Garbeflex brand materials. Results indicate that the method is reproducible to about 2° C. and permits classification of plasticizers in the order of their gelation power with a given PVC resin. At the same time, the data obtained give information on plasticizer behavior and processability of a new resin. (In French.)

"Present Trends on the Field of Decorative Aminoplastics Laminates," P. Stuchlik, PENSEZ PLASTIQUES, 7, 214, 15 (Oct. 1960).

Detailed discussion of the production of decorative laminates, especially paper with melamine resins. The materials, the equipment, methods of impregnating and compressing, finishing, and quality tests are dealt with. Finally, properties of laminates, new possibilities, and applications are considered. (In French.)

"Fiber Glass in Plastics," A. Kirzinger, KUNSTSTOFF-RUNDSCHAU, 7, 9, 930 (Sept. 1960).

Alkali glass fiber generally has been used in Germany for reinforcing plastics because it is much cheaper than the relatively alkali-free product customary in America. However, its applications were limited, chiefly because it could not be produced in continuous lengths until recently. A new, improved, continuous fiber has been developed which is claimed to be practically equal to the alkali-free material for most purposes, and is still cheaper than the latter. Figures are presented to show its properties and also to prove that polyester resins reinforced with the older, unimproved type of fiber have good weathering resistance. (In German.)

"Strength Tests on Glass-Reinforced Samples and Construction Elements," K. G. Reinhardt, PLASTE U. KAUTSCHUK, 7, 11, 533 (Nov. 1960).

Results are reported by the Central Welding Institute, East Germany, of short-term tensile and shear tests on glass-reinforced samples and building components carried out under normal conditions; after boiling for two hours; and after being kept under water. Important results were obtained on the behavior of materials in bending tests on a glass-reinforced girder. Graphs and eight tables. (In German.)

"Oxidation Phenomena in High and Low Density Polyethylenes during Processing," L. Zakrzewski, L. Jacque and P. Dubois, IND. PLASTIQUES MOD., 12, 7, 49 (Aug.-Sept. 1960).

In the reference system used, the first number following the magazine name is the volume number, the second is the issue number (if any), and the third is the first page on which the abstracted article appears in that magazine.

Requests for copies, reprints, or further information on any article abstracted in this department should be addressed to the publisher of the magazine where the article appeared. A complete listing of the publishers and addresses of these magazines is printed here quarterly.

The next complete listing will appear in September. The last listing appeared in the May issue.

After reviewing earlier work by a number of investigators, the authors describe their own studies on oxidation of different polyethylenes during hot milling, using infra-red spectrography. Spectrographic data could be gaged directly on the oxidized polyethylene, instead of being based on mixtures of n-heptane and methyl-undecyl ketone, as has hitherto been customary. From results of tests, the extinction coefficient of the C-O group in the polyethylene spectra could be calculated, thereby simplifying determination of oxygen in the polymer. (In French.)

"Mechanical and Acoustic Properties of Foamed Polystyrene," H. Osten, PLASTVERARBEITER, 11, 8, 353 (Aug. 1960).

Results are described of tests on mechanical and acoustic properties, chiefly of rigid foamed polystyrene, to meet German standards specifications. The apparatus and procedure for determining dynamic elastic modulus by the Vibrometer method are also considered, and a footnote reveals that this method may be incorporated in new test specifications. It is further reported that more flexible polystyrene foams have been developed to m· t proposed standards for above-ground insulation of buildings. (In German.)

"Graft Copolymerization. Part III. Graft Copolymerization by other than Chemical Radiation Methods," J. Techel, PLASTE U. KAUTSCHUK, 7, 10, (Oct. 1960).

After explaining the fundamentals of graft copolymerization by chemical activation, the author discusses activation of unsaturated polymers, cross-linked graft copolymers, and grafting by addition and condensation reactions, chiefly on unsaturated polymers. (In German.)

"Physical and Chemical Properties of Polypropylene Monofilaments," A. Coen and W. Conti, MATERIE PLASTICHE, 26, 8, 723 (Aug. 1960).

Polypropylene monofilaments are attracting much attention at present. The authors review their mechanical properties, dimensional stability, electrical properties as well as the effects of temperature, season and weather, ultra violet light and a number of chemicals. (In Italian.)

"Effect of Molecular Distribution on the Viscosity of Plastisols," J. Sancerni Luna, REVISTA PLASTICOS, 11, 62, 79 (March-April 1960).

Curves indicating polymer chain length, which influences viscosity and aging in plastisols, were indicated. Average molecular weight was calculated from the intrinsic viscosity of fractions. (In Spanish).

Applications

"Noise Abatement and Insulation," H. Baumann, PLASTVERARBEITER, 11, 8, 361 (Aug. 1960).

For noise abatement in factories, Isoschaum (a plastics foam) is sprayed between two layers of fabric either arranged to form light portable enclosures for machinery, or to insulate walls and roofs. (In German.)

"The Future of Polyolefins," W. P. Gideon, FLEXOGRAPHY, 6, 5, 26 (May 1961).

Condensation of a talk given by the author at the 1961 National Flexible Packaging Assn. meeting in March.

"Shaping the Product. 4. The Design Challenge from Abroad," Martyn Rowlands, PLASTICS (LONDON), 26, 282, 59 (April 1961).

A British evaluation of plastics product design in America.

"New Polyester/P.V.C. Laminate Construction," G. Ader, PLASTICS (LONDON), 26, 282, 143 (April 1961).

Applications for a new polyester resin.

"Writing Meaningful Specifications for Plastic Parts," H. S. Byrne, R. L. Miller, and R. N. Peterson, SPE J., 17, 5, 469 (May 1961).

How to select materials, proper part design, and performance tests for moldings.

"High Density Polyolefins in Corrosion Engineering," O. E. Larsen, SPE J., 17, 5, 471 (May 1961).

Design and product ideas for applications.

"Utilization of Unsaturated Polyester Resin for Small-Capacity Electrical Rotating Machines," W. Koga, M. Miyairi, and T. Ogawa. INSULATION, 6, 12, 81 (Dec. 1960).

Description of this application in Japan.

"New Developments in Epoxy Resins," Henry Lee, INSULATION, 6, 12, 87 (Dec. 1960).

The first part of a report on these resins and their applications.

"Trends in Insulating Materials and Application, Particularly High Temperature Problems," H. Wood, INSULATION, 6, 12, 41 (Dec. 1960).

Review of developments in the past 20 years.

"Insulation Materials and Techniques for High Frequency Welding of PVC Film," Vivian Bird, INSULATION, 6, 12, 67 (Dec. 1960).

How these materials can be welded and bonded for this application.

"Plastics vs. Corrosion," R. B. Seymour, RUBBER & PLASTICS AGE, 42, 1, 75 (Jan. 1961).

A brief report on papers presented at the 1961 SPE ANTEC meeting.

"Plastics as Materials of Construction," R. B. Seymour, SPE J., 17, 2, 148 (Feb. 1961).

A review with examples of successful applications.

"Paste Extrusion of Filled TFE-Fluorocarbon Resin for Wire Insulations," R. W. Johnson, SPE J., 17, 2, 151 (Feb. 1961).

Study of the preparation and properties of high-temperature insulated wire with improved abrasion and cut-through resistance.

"New Method + Material = New Bottle," J. H. Chapman, PROGRESSIVE PLASTICS, pg. 31 (July 1960).

Brief review of bottle application by blow molding.

"How Foam Plastics Benefit the Shipbuilding Industry," J. B. Alfers, PROGRESSIVE PLASTICS, pg. 41 (Nov. 1960).

Short review of naval usages.

"Is This Tolerance Necessary?" M. A. Sanders, SPE J., 17, 1, 51 (Jan. 1961).

A brief article on how unrealistic mold tolerances and unskilled part design add unjustified costs.

"How Versatile Vinyl Guards Metal Against Chemicals and Corrosion," James Guffie, PROGRESSIVE PLASTICS, pg. 38 (Nov. 1960).

Brief story on a plastic liner for mixing kettles.

"Plastics for Atom Smashers," J. O. Turner, MATERIALS DESIGN ENG., 52, 5, 132 (Nov. 1960).

Parts for a high-energy nuclear accelerator and its supporting apparatus present problems that are satisfied by using plastics.

"New Pumps From Old Via Plastics," S. S. Susman and Isadore Nusbaum, WESTERN PLASTICS, 8, 3, 27 (March 1961).

Usage of plastics to rebuild and refinish pumps.

"Design Considerations for Best Results with Printed Wiring," C. F. Dwyer, INDIAN PLASTICS, 12, pg. 12 (Dec. 1961).

Review of design problems with etched laminate wiring.

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CALENDAR of COMING EVENTS

July 17-21
Gordon Research Conferences. Elastomers. Colby Junior College, New London, N. H.

July 18-20
Western Plant Maintenance & Engineering Show. Pan Pacific Auditorium, Los Angeles, Calif.

July 27-August 1
International Symposium on Macromolecular Chemistry. Queen Elizabeth Hotel, Montreal, Quebec, Canada.

September 3-8
American Chemical Society National Meeting. Chicago, Ill.

September 12
SPE Central Indiana Section RETEC. Plastics for Tooling. Hotel Severin, Indianapolis, Ind.

October 5
SPE Buffalo Section RETEC. Plastics Foams. Niagara Falls, N. Y.

October 9-11
TAPPI. Plastics-Paper Conference. French Lick-Sheraton Hotel, French Lick, Ind.

October 12-13
SPI New England Section Conference. Wentworth-by-the-Sea, Portsmouth, N. H.

October 16-19
TAPPI Engineering Conference. Economic Solutions through Engineering. Shoreham Hotel, Washington, D. C.

October 17-19
Plastics Show of Canada. Automotive Building, Exhibition Park, Toronto, Canada.

October 25
SPE Kentuckiana Section RETEC. Plastics in Major Household Appliances. Louisville, Ky.

November 2-3
SPE North Texas Section RETEC. Plastics in Packaging and Engineering Exhibition. Sheraton-Dallas Hotel, Dallas, Tex.

November 15
SPE New York Section RETEC. Vinyl Plastics in the Household. Statler-Hilton Hotel, New York, N. Y.

November 26-December 1
ASME Winter Annual Meeting. Statler-Hilton Hotel, New York, N. Y.

December 1
SPE Cleveland Section RETEC. Plastics Screw Injection Molding. Cleveland Engineering Society Building, Cleveland, O.

December 5-7
Building Research Institute 1961 Fall Conferences, Shoreham Hotel, Washington, D. C.

MANUFACTURERS REPS

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Abstract of Important Articles (Cont'd.)

General

"Plastics in Italy," G. F. Moroni, BRIT. PLASTICS, 34, 7, 65 (Feb. 1961).

A round-up of plastics usages in the past few years.

Domestic Production and Sales of Plastics and Resin Material, February and March, 1961

Following are the partly estimated and revised statistics for the domestic production and sale of plastics and resinous material during the months of February and March, 1961. Units listed are in pounds, dry basis unless otherwise specified. Data on alkyds and rosin modifications have not been included since their use is primarily limited to the protective coating industry.

	February, 1961		March, 1961	
	Production	Sales	Production	Sales
Cellulose Plastics:				
Cellulose acetate and mixed ester:				
Sheets, under 0.003 gage	1,416,922	1,318,821	1,688,318	1,858,176
Sheets, 0.003 gage and over	1,568,527	1,639,765	1,889,593	2,066,795
All other sheets, rods, and tubes (including other cellulose plastics)	723,071	746,182	963,218	1,049,986
Molding and extrusion materials (including other cellulose plastics)	6,305,311	6,483,068	7,569,494	7,391,862
Nitrocellulose sheets, rods, and tubes	72,555	89,408	94,244	111,605
TOTAL	10,086,386	10,277,244	12,204,867	12,478,424
Phenolic and Other Tar-Acid Resins:				
Molding materials	15,270,962	13,672,734	17,050,511	15,196,850
Bonding and adhesive resins for—				
Laminating (except plywood)	5,413,017	3,565,340	5,802,652	3,502,709
Coated and bonded abrasives	1,055,336	1,017,493	1,196,322	1,045,424
Friction materials (brake linings, clutch facings, and similar materials)	728,433	674,719	930,662	814,315
Thermal insulation (fiber glass, rock wool)	6,094,516	3,002,040	6,549,186	3,197,578
Plywood	4,648,186	3,905,954	6,077,967	5,270,725
All other bonding and adhesives uses	4,047,172	4,370,721	5,174,622	4,684,782
Protective-coating resins unmodified and modified except by rosin	1,341,449	1,175,124	1,793,585	1,171,263
Resins for all other uses	3,316,421	3,101,367	3,529,542	3,259,873
TOTAL	41,915,492	34,485,492	48,005,053	38,143,519
Urea and Melamine Resins:				
Textile-treating and textile-coating resins	2,211,417	2,208,001	2,543,345	2,463,829
Paper-treating and paper-coating resins	1,886,103	1,874,993	1,962,243	2,013,979
Bonding and adhesive resins for—				
Laminating	2,071,633	1,844,321	2,758,170	2,095,052
Plywood	5,210,954	5,200,784	7,261,494	7,007,816
All other bonding and adhesive uses	3,152,953	3,141,191	3,469,564	3,745,026
Protective-coating resins, straight and modified	2,452,985	1,672,045	2,810,964	1,937,294
Resins for all other uses, including molding	7,854,379	8,544,739	9,047,782	9,863,089
TOTAL	24,840,424	24,486,074	29,853,562	29,126,085
Styrene Resins:				
Molding and extrusion materials:				
Straight polystyrene	19,490,726	17,838,775	21,738,280	20,975,875
All other	26,535,403	26,857,205	28,992,996	33,328,455
Protective-coatings	5,273,707	4,897,982	6,536,211	5,367,546
Textile and paper treating and coating resins	4,888,354	4,908,529	6,822,125	4,907,368
All other uses	11,770,093	17,689,477	14,246,797	21,155,946
TOTAL	67,958,283	72,191,968	78,336,409	85,735,190
Vinyl and Vinyl Chloride Resins:				
Polyvinyl chloride and copolymer resins (50% or more PVC) for—				
Film (resin content)		7,145,170		8,905,355
Sheeting (resin content)		8,877,621		9,036,080
Molding and extrusion (resin content)		20,298,817		24,779,753
Textile and paper treating and coating (resin content)		4,384,624		4,942,797
Flooring (resin content)		12,602,727		14,886,891
Protective coating (resin content)		2,124,130		3,088,556
All other uses (resin content)		8,444,158		11,406,830
All other vinyl resins for—				
Adhesives (resin content)		5,063,504		5,683,283
Protective coatings (resin content)		2,133,287		2,326,742
All other uses (resin content)		8,802,685		10,020,063
TOTAL	81,148,835	79,876,723	93,058,790	95,076,350
Coumarone-Indene and Petroleum Polymer Resins	15,299,184	14,844,521	17,295,221	17,530,596
Polyester Resins:				
For reinforced plastics	10,535,619	9,481,872	11,705,458	10,499,055
For all other uses	1,531,769	1,511,557	2,400,552	2,273,310
TOTAL	12,067,388	10,993,429	14,106,010	12,772,365
Polyethylene Resins:				
For film and sheeting		37,384,225		41,179,312
Molding materials		14,905,468		18,409,475
Extrusion materials		10,965,139		14,312,648
For all other uses		45,014,322		45,127,122
TOTAL	108,308,903	108,269,154	129,264,291	119,028,557[1]
Polypropylene Resins: TOTAL	5,206,235	4,185,596	7,630,570	4,484,136
Epoxy Resins:				
For protective coatings		1,731,732		2,125,804
For all other uses		2,617,044		2,658,847
TOTAL	4,461,280	4,348,776	5,155,367	4,784,651
Silicone Resins	654,623	518,598		494,335
Miscellaneous Synthetic Plastics and Resin Materials	20,720,180	18,459,332	23,073,584	21,050,154
GRAND TOTALS	392,667,213	382,936,907	457,983,724	440,704,362

[1] 19.4% produced by the low-pressure process.

SOURCE: United States Tariff Commission, Chemical Division.

Current Market Prices

Prices in general are f.o.b. works. Ranges indicates variations in grade, quality, quantities, and geographical locations of customers. No guarantee of these prices is made, and spot prices should be obtained by contacting this publication.

Catalysts

Ammonium thiocyanate	lb.	$0.1725/ $0.26
Peroxide, acetyl, 25% in DMP	lb.	1.75 / 4.00
Benzoyl, dry, 96%	lb.	.88 / 2.00
Paste	lb.	.91 / 2.25
Wet, 50% paste in TCP	lb.	.89 / 2.25
In silicone fluid	lb.	2.75 / 4.25
In BBP	lb.	3.00 / 4.25
Caprylyl, liquid, 50% in mineral oil	lb.	4.45 / 5.00
In DOP	lb.	5.00
Cyclohexanone, 45% paste in DBP	lb.	3.00 / 4.00
Powder, 85%, in DBP	lb.	2.00 / 3.00
p-Cyclobenzoyl, paste, 50%		
In mineral oil	lb.	4.25 / 5.00
In TCP	lb.	5.00
2,4-Dichlorobenzoyl, 50%		
In silicone oil	lb.	4.25 / 5.00
40% in silicone oil	lb.	5.00
Di-t-butyl	lb.	1.75 / 4.00
Other peroxides	lb.	2.05 / 5.00

Colorants

Black, std.	lb.	.90 / 4.10
Gel coats	lb.	.61 / .86
Carbon black	lb.	.0575/ .87
Paste	lb.	.65 / .74
Bone blacks	lb.	.155 / .2775
Iron oxide	lb.	.1275/ .23
Lampblack	lb.	.1225/ .175
Masterbatch	lb.	.60 / .63
Paste (for epoxies)	lb.	1.58 / 2.15
(for vinyls)	lb.	.50 / .66
Paste dispersion	lb.	.85 / 1.90
Paste concentrate	lb.	.82 / 1.20
Pigment dispersion	lb.	.83 / 1.15
Colloidal dispersions	lb.	.66 / 1.45
Aqueous	lb.	.115 / .395
Blue, std.	lb.	.90 / 2.75
Concentrate	lb.	.95 / 3.00
Masterbatch	lb.	.85 / 1.13
Pearl	lb.	1.38
Metallic	lb.	.02
Paste (for epoxies)	lb.	1.25 / 2.60
(for vinyls)	lb.	.62 / 1.84
Paste dispersion	lb.	.85 / 2.40
Paste concentrate	lb.	.78 / .80
Phosporescent	lb.	.24
Brown, std.	lb.	.87 / 4.00
Copper tinsel	lb.	.10
Gel coats	lb.	.59 / 1.04
Iron oxide	lb.	.15 / .24
Metallic bronze	lb.	.02
Paste (for epoxies)	lb.	1.18 / 1.47
(for vinyls)	lb.	.48 / 1.67
Paste dispersions	lb.	.75 / 1.70
Paste concentrate	lb.	.65 / 2.30
Gold, metallic	lb.	.21
Paste dispersions	lb.	1.40 / 1.60
Tinsels	lb.	.10
Gray, gel coat	lb.	.59 / .84
Paste (for epoxies)	lb.	1.40
Paste dispersion	lb.	1.45 / 2.20
Green, std.	lb.	.90 / 3.25
Pearl	lb.	.10
Concentrate	lb.	.95 / 3.00
Metallic	lb.	.21
Phosphorescent	lb.	.24
Masterbatch	lb.	1.20 / 1.23
Paste (for epoxies)	lb.	2.86
(for vinyls)	lb.	.80 / 1.83
Paste dispersions	lb.	.85 / 2.70
Paste concentrate	lb.	.80 / 2.15
Chromic oxide	lb.	.45 / 1.40
Orange, dry	lb.	.49 / 3.50
Gel coat	lb.	.75 / 1.05
Lithopone	lb.	1.63 / 1.86
Paste (for epoxies)	lb.	1.58
(for vinyls)	lb.	.74 / 4.27
Paste dispersion	lb.	.55 / 2.80
Paste concentrate	lb.	1.58
Purple, pearl	lb.	.10
Red, std.	lb.	.1425/ 5.00
Cadium lithopone	lb.	1.90 / 2.86
Selenide	lb.	4.60 / 7.15
Concentrate	lb.	2.25 / 2.50
Iron oxide	lb.	.0475/ .205
Metallic	lb.	.021
Masterbatch	lb.	.75 / .88
Paste (for epoxies)	lb.	2.35 / 3.77
(for vinyls)	lb.	1.20 / 3.82
Paste dispersions	lb.	.90 / 3.05
Paste concentrate	lb.	5.42 / 6.49
Venetian	lb.	.065 / .1325
Silver, metallic	lb.	.0165
Paste (for epoxies)	lb.	1.55
(for vinyls)	lb.	.89 / .91
Paste dispersion	lb.	$0.85 / $1.45
Paste concentrate	lb.	1.02
Tinsels	lb.	.10
Yellow, std.	lb.	.12 / 3.50
Cadium lithopone	lb.	1.21 / 1.29
Gel coat	lb.	.61 / 1.03
Masterbatch	lb.	.90 / .93
Concentrate	lb.	1.00 / 2.50
Iron oxide	lb.	.1225/ .1875
Paste (for epoxies)	lb.	2.15 / 2.55
(for vinyls)	lb.	.58 / 3.70
Paste dispersions	lb.	.90 / 2.20
Paste concentrate	lb.	.65 / 2.87
White, std.	lb.	.54 / 4.00
Concentrate	lb.	.70 / 1.25
Gel coat	lb.	.59 / .84
Masterbatch	lb.	.75 / .80
Paste (for epoxies)	lb.	1.02
(for vinyls)	lb.	.48 / .60
Pearl	lb.	.10
Paste dispersion	lb.	.70 / 2.00
Paste concentrate	lb.	.705 / .725

Fillers

Aluminum silicate pigments	ton	21.50 / 65.00
Barytes	ton	60.00 / 123.00
Paste concentrate	lb.	.705 / .725
Calcium carbonate, ppt	ton	30.00 / 187.00
Std.	ton	15.00 / 35.00
China clay	ton	40.00
Flours	ton	50.00 / 106.00
Flocks, cotton	lb.	.12 / .30
Rayon	lb.	.50 / 1.25
Nylon	lb.	.35 / 2.75
Mica	lb.	.075 / 4.44
Silica	ton	25.00 / 48.50
Whiting	ton	8.75 / 13.25
Oster shell	lb.	30.00
Wollastonite	ton	29.00 / 47.50

Miscellaneous

Anti-Fog	gal.	8.69 / 16.95
Anti-Static	gal.	3.57 / 8.50
(for films)	gal.	8.00 / 8.50
Odorants	lb.	1.25 / 10.00
Purging cmpd. (for injection)	lb.	.40
Wetting agent (for dry coloring)	gal.	2.50 / 3.20
(for wet operations)	lb.	2.39 / 3.69

Mold Release Agents

Silicone type: Cmpds	lb.	4.70 / 5.20
Aerosols	20 oz. can	.80 / 1.00
Emulsions	lb.	1.09 / 1.65
Fluids	lb.	2.74 / 6.00
Solvent emulsions	lb.	.40 / 4.95
Stearates: Barium	lb.	.41 / .46
Calcium	lb.	.39 / .44
Magnesium	lb.	.42 / .47
Zinc	lb.	.41 / .48

Plasticizers

Adipate, Butyl Cellosolve	lb.	.45 / .47
Didecyl	lb.	.265 / .375
Dibutoxyethyl	lb.	.425 / .46
Diisodecyl	lb.	.40 / .44
Diisobutyl	lb.	.41 / .44
Dioctyl	lb.	.36 / .535
Diisooctyl	lb.	.36 / .435
2-ethyl hexyl	lb.	.36 / .435
Isooctylisodecyl	lb.	.40 / .435
Isooctyl	lb.	.49 / .535
n-Octyl decyl	lb.	.36 / .44
Azelate, dioctyl	lb.	.445 / .49
Di-2-ethyl hexyl	lb.	.40 / .465
Dibenzoate, Diethylene glycol	lb.	.285
Dipropylene glycol	lb.	.285
Diethylene glycol	lb.	.45 / .60
Triethylene glycol	lb.	.60
Epoxy, polymeric	lb.	.3225/ .3525
Monomeric	lb.	.3475/ .3775
Ester, Fatty Acid	lb.	.3525/ .3775
Monomeric	lb.	.35 / .60
Laurate, Butoxyethyl	lb.	.39 / .40
Oleate, Butyl	lb.	.24 / .33
Butoxyethyl	lb.	.30 / .33
Methoxyethyl	lb.	.31 / .34
Phosphate, Tributyl	lb.	.50 / .535
Tricresyl	lb.	.325 / .36
Phthalate, Butyl Cellosolve	lb.	.35 / .385
Butyl octyl	lb.	$ .255 / $ .30
Cyclohexyl	lb.	.265 / .305
Isodecyl	lb.	$0.26 / $0.30
butoxyethyl	lb.	.305 / .375
Dibutyl	lb.	.27 / .43
Dicaprvl	lb.	.265 / .445
Dicyclohexyl	lb.	.48 / .595
Didecyl	lb.	.27
Diisodecyl	lb.	.45
Diisooctyl	lb.	.26 / .445
Dioctyl	lb.	.245 / .305
Isooctyldecyl	lb.	.27 / .45
Methoxyethyl	lb.	.355 / .405
Polyester type	lb.	.385 / .7125
Polymeric type	lb.	.39 / .93
High-solvating	lb.	.37 / .425
Ricinoleate type	lb.	.32 / .35
Sebacate, Dibenzyl	lb.	.91 / 1.04
Dibutyl	lb.	.655 / .745
Dioctyl	lb.	.57 / .6825
Soy Bean oil, epoxized	lb.	.3235/ .4775
Stearate, Butyl	lb.	.235 / .295
Butoxyethyl	lb.	.31 / .32
Epoxized octyl	lb.	.3475/ .5325
Methoxyethyl	lb.	.32 / .35
Octyl epoxy	lb.	.3925/ .447
Tallate, Octyl epoxy	lb.	.3475/ 4.025

Resins, Molding, Casting & Coating

ABS type	lb.	.44 / 1.05
Acetal	lb.	.65 / .93
Colors	lb.	.74 / 1.24
Acrylic	lb.	.46 / 1.08
Alkyd	lb.	.1325/ 1.20
Allyl (diallyl phthalate)	lb.	.95 / 2.50
Carbonate	lb.	1.30 / 2.25
Cellulosics:		
Cellulose acetate	lb.	.35 / .68
Reprocessed	lb.	.25 / .36
Cellulose acetate-butyrate	lb.	.40 / .81
Reprocessed	lb.	.35 / .45
Cellulose propionate	lb.	.40 / .81
Ethyl cellulose	lb.	.67
Reprocessed	lb.	.30
Epoxy, liquid	lb.	.60 / 1.41
Solid	lb.	.51 / 1.31
Ethylene copolymers	lb.	.32 / .95
Fluorocarbons	lb.	3.25 / 11.00
Furane	lb.	.75 / 1.00
Liquid	lb.	.32 / .44
Melamine	lb.	.57 / .70
Coating solns.	lb.	.3275/ .4375
Phenolic	lb.	.207 / 1.12
Coating solns.	lb.	.305 / .3525
Polyamide	lb.	.62 / 1.26
Coatings	lb.	.61 / 1.51
Graphite-filled	lb.	1.40 / 1.83
Heat-stabilized	lb.	1.09 / 1.55
Molybdenum sulfide-filled	lb.	1.19 / 2.07
Polycarbonate	lb.	1.30 / 2.29
Polyester, powder	lb.	.26 / 2.20
Coating	lb.	.0975/ .1275
Glass-reinforced	lb.	.41 / .80
Polyethylene, low-density	lb.	.2375/ .615
Medium-density	lb.	.2375/ .6425
High-density	lb.	.275 / 1.29
Polypropylene	lb.	.42 / 1.17
Reprocessed	lb.	.50
Polystyrene	lb.	.18 / 1.34
Reprocessed	lb.	.15 / .26
Rubber-modified	lb.	.20 / .275
Polyurethane	lb.	1.30 / 7.50
Silicones, casting	lb.	7.50 / 11.40
Molding	lb.	2.40 / 3.55
Urea coating solns.	lb.	.205 / .27
Vinyl, dispersion grade	lb.	.24 / .325
Copolymers	lb.	.2025/ .44
Molding	lb.	.185 / .66
Nitrile rubber blend	lb.	.45 / .53
Reprocessed	lb.	.19 / .22
Vinyl-vinylidene copolymer	lb.	.185 / .32
Vinylidene	lb.	.205 / 6.00
Latex	lb.	.45 / .52

Solvents

Ketones: Acetate	lb.	.08 / .22
Methyl isoamyl	lb.	.175 / .315
Esters: Ethyl acetate	lb.	.125 / .2675
Isopropyl acetate	lb.	.115 / .255
n-Butyl acetate	lb.	.145 / .285
Alcohols: Isobutyl	lb.	.13 / .27
n-Butyl	lb.	.155 / .295

Stabilizers

Alkyd tin mercaptide, liq.	lb.	2.50 / 3.15
Barium-cadmium complex, liquid	lb.	.50 / .585
Solid	lb.	.97 / 1.25
Barium-cadmium laurate	lb.	.87 / .90
Myristate	lb.	.72 / .75
Barium-cadmium-zinc complex	lb.	.54 / .56
Barium-zinc, liquid	lb.	.58 / .615
Powder	lb.	.375 / .44
Complex	lb.	.47 / .50
Cadmium-barium, powder	lb.	.68 / .895
Chelating agent, liquid	lb.	.57 / .84
Cadmium-containing	lb.	.84 / .87
Zinc-containing	lb.	.62 / .80
Organic complex, liquid	lb.	.57 / .845
Strontium-zinc laurate	lb.	.72 / .75
Zinc, liquid	lb.	.48 / .52

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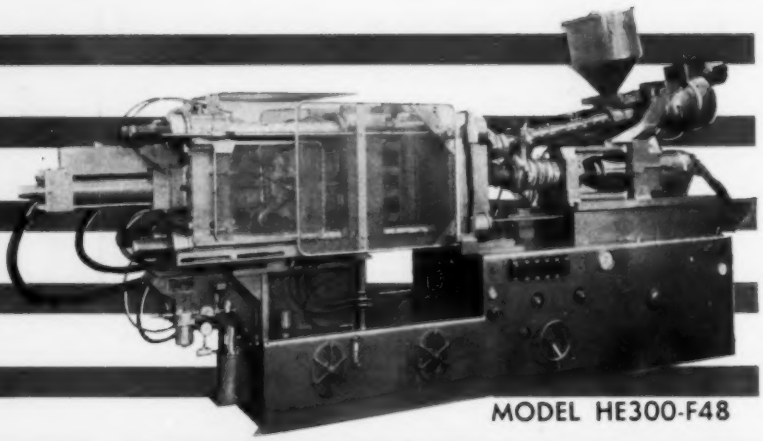

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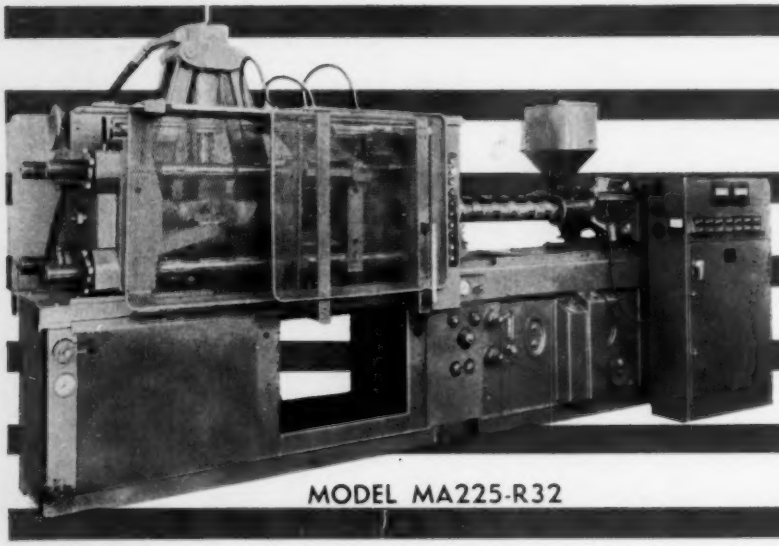

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